THE

ARCHITECTURE

OF

M·VITRUVIUS·POLLIO:

TRANSLATED

FROM THE ORIGINAL LATIN,

BY

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MDCCLXXI.

PREFACE.

WHILE all the poliſhed nations of Europe poſſeſs a Tranſlation of the Architecture of M. Vitruvius Pollio, whereby their architects have the opportunity of peruſing, in their own language, the father of their art, Great Britain, and its extenſive dominions, remain without that advantage; and the Britiſh architects (for the major part) without the knowledge of the moſt ancient writer on the ſubject, whoſe labours have reached our times.

THE nations around us having been all long ſince thus provided, it may ſeem to caſt ſome reflection on our taſte, and talents for the fine arts, that we have ſo long neglected this diſtinguiſhed author. The art he teaches, is one of the moſt uſeful, elegant, manly, and comprehenſive, in which the ſtrongeſt intellects and moſt fertile fancy may have ſcope to move, and the efforts of the judgment and genius may be ſhewn united.

BUT our neglect of the arts hitherto, and the little figure we have made therein, may probably be owing to our inteſtine commotions, and the unſettled ſtate of the nation for many years paſt. The arts could not be regarded, while objects more eſſential to the public good were ſtruggling, and in hazard. Italy long enjoyed a profound tranquility; there therefore the arts revived and flouriſhed, but now ſeem to be retiring. We may obſerve alſo that the courſe of the arts, as well as of empire, has been directed weſtward; and they may not yet have arrived at the full zenith of our iſle. They however now appear to be advancing apace, and there is a proſpect that they will reach their utmoſt heighth and perfection in this nation.

LONG before I entertained any thoughts of this undertaking, I had frequently occaſion to obſerve the want of of an Engliſh tranſlation. To have recourſe to the text, on all occaſions, is not ſufficiently expeditious in buſineſs, for thoſe who are not exceedingly well verſed in the Latin, nor indeed, for thoſe who have not particularly ſtudied the ſtile and terms of this author. It is true that the majority of thoſe who have wrote on architecture have drawn the principles they inculcate from the text of Vitruvius, and their writings are in a great meaſure tranſcripts of his; they, neverthelefs, do not anſwer the end of a tranſlation: the precepts of Vitruvius are often promiſcuouſly blended with their own ideas, or interpreted in ſuch a manner as to ſerve a particular purpoſe, by which means the ſenſe of the original is perverted, or miſrepreſented.

PERAULT, in the preface of his French tranſlation, attributes the difficulty of tranſlating this author to the neceſſary qualifications for ſuch a performance rarely meeting in one perſon. An architect, bred chiefly to the knowledge of his profeſſion, is ſeldom ſufficiently ſkilled in language, and ſeveral other requiſite ſciences; and very few men of literature have a knowledge of architecture, and a genius for the fine arts, ſufficient to enable them to undertake the taſk; the turn of mind adapted to the one ſeeming unſuited to the other kind of ſtudies: we may add likewiſe, that, in thoſe who may be ſufficiently qualified, the inclination and opportunity to exert their abilities in ſuch a work do not always concur. To wait, therefore, till all theſe requiſites unite, might be endleſs; and it may be preferable to

equal success of an inferior performance, in some degree useful, than to be wholly without the knowledge of this author. These reasons, and seeing it neglected by others, have induced me to attempt this arduous undertaking; not vainly presuming on abilities equal to the task, but hoping that in the knowledge of the principal subject, and in some degree, at least, of the several necessary qualifications, I may not be found deficient.

THE esteem in which the writings of this author have ever been held, is apparent from the number of manuscripts, printed editions, and translations into all the European languages which have been made thereof. The fifteenth century, the time when the fine arts began to revive, gave birth to many printed editions, comments, and translations of this author, in sundry parts of Europe; of these, it is proper to give some account.

THE first printed edition of the text was that of Sulpitius, which appeared about the year 1486. *In* 1496, *one was printed at Florence; and, in* 1497, *another at Venice. In* 1511, *Jocundus published a new edition at Venice, which he reprinted, with corrections, at Florence, in* 1513, 1522, *and* 1523. *In* 1521, *the first translation was made in Italian, by Cæsar Cesariani, and published at Como, in the Milanese. Another Italian translation was published by Lucio Durantino, at Venice, in* 1524, *and again in* 1535. *In* 1536, *an Italian translation of the first five books, by Giovanni Baptista Caporali, was published in Perusia.*

IN 1542, *A Compendium of the Writings of Vitruvius, in the Spanish tongue, was published at Madrid, by Don Didaco Segredi, which was reprinted at Toledo, in* 1549 *and* 1564. *A new Latin edition was printed at Strasburgh, in* 1543, *and again in* 1550.

IN 1544, *Philander published his Latin Annotations on the ten Books of the Architecture of Vitruvius, incited thereto by Francis the First, stiled The Restorer of the Liberal Arts; but, in these annotations, more regard is shewn to literary punctilios, and the etymology of the Greek and Latin terms, than to the illustration of the architectonical matters.*

IN 1547, *the year Francis the First died, the first French translation appeared; executed by Jean Martin, secretary to the Cardinal de Lenoncour, with the assistance of J. Goujon, architect to the kings, Francis the First and Henry the Second: this was dedicated to the latter of the two kings, though that compliment was evidently intended to the former, had not his death prevented it. This translation, which was made by a man of letters, who had not a competent knowledge of architecture, is found to have very little merit; it was, however, reprinted in* 1572, *and again at Cologne in* 1618.

IN 1548, *a German translation, with notes, was published at Nuremburgh, by Gualter Rivius; which was republished at Basil, in Switzerland, in* 1575 *and in* 1614. *This translation is commended by Sir Henry Wotton, in his Elements of Architecture.*

IN 1552, *Philander published, at Lions, a Latin edition of Vitruvius, with annotations; and again in* 1586 *at Geneva.*

IN 1556, *the learned Daniel Barbaro, patriarch of Aquileia, published an Italian translation of Vitruvius at Venice, with draughts and copious annotations; in which it is probable he had the assistance of that celebrated and ennobled architect Andrea Palladio; their draughts, as well as their explanations of sundry passages of the text, exactly corresponding. This translation was again published in* 1567, *accompanied with a new edition of the text and comments by the same hand, and the translation was again published at Venice, in* 1629.

AN Italian translation was intended by Giovanni Antonio Rusconi, but his death prevented its appearance: the draughts he left were, however, collected by Giolito, and published at Venice in 1590, *with short explanations annexed. Many manuscript translations are said to be dispersed about Italy, which where never printed; one is now*

preſerved in the Vatican library, at Rome; and another in the Corſini library, believed to have been made by Sangallo.

IN 1649, *a valuable edition of the text, with comments extracted from Philander, Barbaro, Salmaſius, and other commentators, was publiſhed at Amſterdam, by J. de Laet, and dedicated to Chriſtina, queen of Sweden; to this was annexed The Elements of Architecture, wrote by our countryman, Sir Henry Wotton, and The Comments of Marcus Meibonius on Vitruvius. The Diſſertation of Nicholas Goldmanus on the Ionic volute, and the Lexicon of Bernardino Baldus, explaining the unuſual words and technichal terms made uſe of by Vitruvius, together with his Treatiſe on the Scamilli Impares, mentioned in the third chapter of the third book.*

AFTER this comes the pompous French tranſlation, executed by the learned Claude Perault, phyſician and architect, at the command and expence of Lewis the Fourteenth, enriched with numerous comments and elegant engravings, this was publiſhed in 1673, *and indeed much excelled all the preceding tranſlations; it was again publiſhed, with corrections, in* 1684.

SINCE this, divers men of erudition and ingenuity have wrote comments on the writings of Vitruvius, particularly the Marquis Poleni, in his treatiſe, ſtiled Exercitationes Vitruviani, publiſhed in 1739 *and* 1741. *An edition of the text has been long expected from the ſame hand, but has never yet appeared.*

OUR countryman, John Evelyn, Eſq. F. R. S. muſt not be wholly omitted; he has given ſome pertinent remarks on the terms of Vitruvius, in his tranſlation of the parallel of the ancient architecture with the modern, which he publiſhed in 1664, *and dedicated to Charles the Second.*

ROBERT Caſtel, in his Villas of the Ancients, which he publiſhed in 1728, *and dedicated to Richard, Earl of Burlington, profeſſes that he undertook that treatiſe as a preparative to a tranſlation of Vitruvius into the Engliſh language; a work he had long entertained a deſire of performing: this intention of Robert Caſtel was mentioned in the Acta Euriditi Lipſiæ,* 1731: *he, however, never fulfilled his promiſe; and it is probable that his immature death prevented his deſign.*

LASTLY, in 1758 *apppeared, at Naples, an edition of the text, joined with an Italian tranſlation, dedicated to the King of Naples, by the Marquis Berardo Galiani; this performance has eclipſed all the preceding. The Marquis has made ſeveral new and uſeful illuſtrations; he very ſtrictly adheres to the text, and his comments are judicious and chiefly relative to the principal ſubject, architecture, which moſt of the former commentators have too much neglected. To the labours of this author I muſt acknowledge myſelf much indebted; they have been of conſiderable ſervice to me in the courſe of this undertaking, although our ſentiments have not in every circumſtance coincided.*

IT is now neceſſary to ſpeak of this tranſlation, and to give ſome account of the methods purſued in the conduct thereof, in order to render it more intelligible to the reader.

I Have made uſe of the printed editions of Barbaro, De Laet, and Galiani, and, when occaſion required, of ſundry manuſcripts. I have in no place, as I recollect, taken the liberty to alter, or depart from the text; but, if any difficulty or ambiguity has occurred, have remarked it in the notes, and given the opinions of the commentators, or my own thoughts thereon. Many reaſons concurred to induce me to be as literal in the tranſlation as poſſible; this has often occaſioned me to run into the Latin idiom; which, although it may read leſs fluently, will not be leſs intelligible, and, by conveying the meaning more exactly, may be in ſome reſpects more uſeful. The numerous ambiguities, the peculiar ſtyle, and uſe of the technical terms, made it impoſſible to be avoided without much circumlocution, or the hazard of perverting the ſenſe of the author; and this, thoſe who are beſt acquainted with the uncertainty and perplexity of the text in many parts will not, I believe, be the moſt forward to cenſure.

IN order to avoid a multiplicity of words and explanations, I have made use of letters of reference, which are placed next to the word referred from; such of these as are not in the text, and have not been used by Vitruvius himself, are inclosed in parentheses; and wherever it has been necessary, for the sake of rendering the passage more intelligible, to add a word that is not drawn from the context, it is usually enclosed in a parenthesis.

THE modern technical terms being very indeterminate and uncertain, differing in different times, places, and persons; and, in our own language, being almost wholly borrowed from the Italian or French, I have thought it most advisable to adhere to the Latin terms entirely, and to explain them where necessary in the notes: the reader will, therefore, find the explanation of any unknown term at that place where it is first mentioned, as well as at other places, by the letters of reference and figures.

IN noting the draughts, I have followed the order in which they are described by Vitruvius, numbering them from the first onward, so that they may be bound at the end of the several books to which they respectively relate, in the manner they were disposed by Vitruvius himself; or altogether, at the end of the whole; or each opposite to the page wherein it is described.

THE draughts which Vitruvius himself made and annexed to his book are all lost, so that his commentators have been obliged to compose them anew from his descriptions. In doing this, as well as in investigating the sense of the obscure passages of the text, I made it a rule to collect my own ideas on the subject before I allowed myself to learn those of others; after which, I examined and consulted all others I could meet with; and from the whole, with as much impartiality as I could master, selected that which I judged the most consistent and most conformable to the intention of the author; to this method, the several corrections and new illustrations, which, I think, will be found in the ensuing work, are chiefly owing: the previous knowledge of the ideas of others so influences the mind, that it becomes almost impossible, or at least very difficult, to think in any other tract.

IN the comments, I have chiefly attended to the explanation of the architecture and of matters relative thereto, leaving other subjects, as being out of my province, to be discussed by those who are more concerned in such studies.

THE division into chapters is not used in any of the manuscripts I have met with, and was probably not done by Vitruvius, the ancients not using that mode of dividing their writings; it is said to be found in some manuscripts, having been done, as it is supposed, by the copyists, and is used in all the printed editions; I have, therefore, thought proper to retain it in this translation, as, by dividing and distinguishing the several subjects, it facilitates the discovery of any part of the discourse, and helps the memory.

THE prints, in general, are to be considered only as explanatory sketches; the nature of the work requires no other, their use being solely to exemplify and illustrate the discourse. Perault has, I know, been lavish in the number, magnitude, and workmanship of his engraving; but his work was done at the expence of a king. Galiani has not been so profuse, and yet his draughts answer the purpose as well: mine, I hope, will be found not inferior to Galiani's in any useful quality, and in some respects superior; but, though I have slighted the manual part, I have given due attention to their composition, and endeavoured to form them according to the true meaning of Vitruvius; it is, therefore, to be hoped that the public will distinguish between the utile *and the* dulce, *and not contemn the substance solely because it may want the shadow.*

I HAVE now and then occasion to give my own opinion; this, I believe, I have generally done without accompanying it with any of the usual terms of diffidence or humility; they are omitted to avoid that unnecessary affectation, and for the sake of brevity; the reader is therefore requested not to impute that omission to confidence or self-conceit. I wish it to be understood that I speak my sentiments with that diffidence that becomes every man. I have endeavoured to be in the right; but, if I have failed, I shall with pleasure see my errors corrected: my aim is truth, and by whomsoever it is found it is to me equally welcome and acceptable.

THE generality of people, I well know, are governed in their opinion of a work by the reputation and fame of the author; even among those who are judges, all are not free from that prejudice which arises from his eminence or obscurity; and with difficulty allow any share of merit to the performance of a man unknown, or unsupported by great patronage. In offering this work to the world, therefore, I am sensible of the hazard of its reception; it must however make the venture; averse to solicitation, I prefer the hazard: if it should be found in any degree useful, it will, in time, need no other recommendation; and, if otherwise, I am content that it should meet the neglect it may deserve.

IN perusing the following treatise, the reader will meet with several passages that will occasion him to reflect on the difference between Vitruvius's manner of teaching the art and that made use of by modern masters; the former directs us to vary the proportions and dispositions of the members according to the magnitude, situation, purpose, and other circumstances of the building; the latter offer no rules of that kind, but prescribe a certain fixed modulation of the parts of each order to be used in all edifices however circumstanced: each author recommending such as his peculiar studies, or some other accidents, have occasioned to make a favourable impression on his mind; but I see no reason for such a partial attachment to any certain manner, nor merit in such indiscriminate application of it: it appears more like mechanism than intelligence: the weakest understanding and poorest genius may be capable of attaining such an habit. It is, indeed, the general fate of artists to be manneristS; but it is not on that account less erroneous, nor ought it to be less opposed.

I Imagine that every building should by its appearance express its destination and purpose, and that some character should prevail therein, which is suitable to, and expressive of, the particular end it is to answer. To effect this will require the exertion of the powers of the mind, the fire of genius, and the solidity of judgment; and without this, a composition is but a compilation of parts, without meaning or end.

ARCHITECTURE may be distinguished into the essential and the ornamental parts; the first regards the real qualities of buildings, their convenience, strength, &c. the other has relation only to their outward appearance, or effect. In the former respect, architecture ranks with those arts which relate to the necessaries and conveniencies of life; in the latter, with the arts of entertainment, painting, poetry, and music, called the liberal arts. 1*

SOME may object, that as the end of all compositions in the liberal arts is to entertain, provided they appear pleasing, it is sufficient, without regarding whether that appearance is suitable and adapted to the circumstances of the work. It is true that such an appearance will be sufficient to please the fancy, but not to satisfy the judgment. Works of art should please by their propriety as well as beauty; and a pleasing appearance that is suitable to the work must certainly be preferable to one that is unsuitable: the gaiety and lightness of a villa may be equally pleasing if applied to a prison or a castle; but no one can affirm that they will be equally proper and well adapted. Beauty will, by repetition and continuance, lose its effect; but propriety will maintain and produce its effect for ever. It may be added also, that works of art may be directed to the elevation and improvement of the mind, as well as to its entertainment only, by exciting worthy or generous sentiments; and that this, perhaps, should be considered as their ultimate end, to which the pleasure they afford is only the attractive means.

IT appears, therefore, that the first care of an architect, when he is about to design any building, should be to consider the full destination and purpose of the edifice, from thence to determine the character which is proper and suitable thereto, and then to compose the building in such a manner as to be expressive of such character. I am now speaking only of the appearance and ornamental part of buildings; not of their convenience, strength, or other essential qualities, which are understood to be always first regarded.

(1*) *Architecture, as well as sculpture, is included by the word painting, which, in this case, is understood to signify all those arts of entertainment whose effects are perceived by the sense of seeing, as music and poetry do those which relate to the hearing and understanding.*

THE appearance of any character in an object, I suppose to be the result of the particular modification of its component parts, and the aptness and allusion of the ornaments. To modify an object, is to vary, or graduate, its sensible properties. In architecture, and other arts respecting the sight, such properties only as are visible are to be attended to: viz. all that relate to figure and colour; and, in other arts, such properties as relate to the senses to which those arts respectively belong.

THE destination of a building is divisible into three heads: as, for example, the use it is to serve, the place in which it is to be situated, and the person for whose use it is intended; each should be considered in determining the character suitable to the building.

THE characters or effects, which there may be occasion to express, in buildings, may be distinguished into the pleasing and the elevating, or those of beauty and dignity; the several characters of either class might be ascertained, as well as the kinds and degrees of the sensible properties that will produce the appearance of each character; but it would carry me farther than I intend in this preface; in which I only mean to give a general sketch of my sentiments on this matter, in order to shew the opening there seems to be for a full disquisition of the subject, and the possibility of bringing the art of designing in architecture (which, at present, has no guide but fancy or habit) to some regulation and certainty.

OBSERVATIONS

CONCERNING THE

LIFE OF VITRUVIUS.

WE know little more concerning Vitruvius than what is to be gathered from his own writings. From theſe we learn, that his parents cauſed him to be early inſtructed in architecture, as well as in many other ſciences. We have no account of his parents, or the place of his birth; but he was doubtleſs a native of ſome part of Italy, if not of Rome itſelf; for, in ſundry parts of his book, he uſes the words *nos*, *noſter*, &c. to diſtinguiſh the Romans, and their buildings, from all others. By the knowledge he appears to have had of divers nations, and their public edifices, it is very probable that he had ſpent much of his time in travel. He tells us, he had acquired ſome fortune, as well as reputation, by his profeſſion; but, in his ſixth proem, he ſays, it was not to be wondered at, that he was ſo little known; for he had not, like the generality of architects, been forward in ſoliciting and petitioning for employment, having learnt not to be ſolicitous of care, and being aſhamed to requeſt advantages.

HE was one of the engineers of the Roman army, civil and military architecture being at that time united and practiſed as one profeſſion. From his own words, in his ſecond preface, we learn that he was low of ſtature, and was old and infirm when he publiſhed his writings. The period in which he wrote, and the Emperor to whom he dedicated his books, are points not yet aſcertained; ſome arguing for the time of Auguſtus, and others for that of one of the ſucceeding Emperors, particularly Titus. The former opinion is, however, the moſt generally received; notwithſtanding which, ſeveral circumſtances that I have obſerved, oblige me to incline to the latter. I will, therefore, here mention the principal arguments on both ſides, that the reader may be able to judge for himſelf.

THE arguments for the reign of Auguſtus are,

1ſt. THAT, though Vitruvius, in the courſe of his work, makes mention of many remarkable public edifices that were erected before the reign of Auguſtus, he yet mentions none of thoſe magnificent ſtructures that were erected during, or after that time; which it is probable he would not have omitted had he wrote after that period.

2dly, That Vitruvius does not treat of amphitheatres, which were common in the time of Titus, although ſcarcely known in that of Auguſtus; and it is to be ſuppoſed that he would not have omitted treating of ſuch large, elegant, and ſingular buildings, if they had been common at the time he lived.

3dly, That Vitruvius (Book III, Chap. II) mentions *The Stone Theatre*, ſpeaking in the ſingular number, which implies that there was but one ſtone theatre in his time, (*viz.* Pompey's theatre;) and, as there was but that one in the beginning of Auguſtus's reign, and as ſeveral were erected during that, and the two or three following reigns, it is probable that Vitruvius wrote at a time when there was only that ſingle ſtone theatre ſubſiſting, and conſequently in the time of Auguſtus; for if there had been ſeveral ſtone theatres at the time he wrote, he could not have diſtinguiſhed one by that title, to which they had all an equal right. And,

4thly, That the manner in which Vitruvius mentions the authors Accius and Ennius, and alſo Lucretius, Cicero, and Varro, (the two former as ancient, the three latter as living in or near his own time) agrees perfectly well with the time of his writing, ſuppoſing it to have been in the reign of Auguſtus.

It muſt be allowed there is ſome force in theſe arguments; but they cannot be ſaid to be entirely concluſive; for the firſt argument only proves, that Vitruvius did not write much before the time of Auguſtus, and in no wiſe renders it evident that he did not write long after. If he mentions none of thoſe buildings that were erected during or after the reign of Auguſtus, it may be ſuppoſed he had no occaſion to mention them; they might not be the examples he wanted.

In anſwer to the ſecond argument, it may be ſaid, that though Vitruvius does not treat of amphitheatres, yet neither does he treat of circuſes, which were buildings equally worthy of deſcription, and had been in uſe ſome ages before the time of Auguſtus. But, as he mentions both theſe kinds of buildings*, it is certain that amphitheatres were in uſe in his time. Why he did not deſcribe them we know not; however, his not deſcribing them is no proof that they were unknown when he wrote; on the contrary, his manner of mentioning them, implies they were in common uſe in his days: and, as we know by hiſtory that thoſe buildings were not in common uſe till near the time of Titus, it conſequently amounts to a proof on the other ſide the queſtion, *viz.* that he did not write till near that time.

The third argument is anſwered by obſerving, that the theatre of Pompey, being the firſt built of ſtone, might of courſe be called the Stone Theatre at its firſt building, to diſtinguiſh it from all others, which at that time were of wood; and, having obtained that appellation at firſt, might ever after retain it. So, in our days, Newgate ſtill retains the name of one of our old city gates, and Pont Neuf of an old bridge at Paris, though the circumſtance from which they firſt obtained thoſe names, (*viz.* their being then new) no longer exiſts. It is true we cannot be certain that this was the caſe with Pompey's theatre; but neither can we be certain that it was not the caſe. This argument, therefore, is balanced; and is concluſive neither on one *ſide nor* the other.

The fourth argument is not more concluſive than the former; for the manner in which Vitruvius mentions the authors there named, agree as well with the time of Titus as with that of Auguſtus; for, as there was only a term of ſixty-five years between the reigns of thoſe two emperors, and as Vitruvius was old when he publiſhed his books, he might well conſider the former two of thoſe authors as ancient, in compariſon of the latter three, who might have been living in or near his own time.

The arguments on the contrary ſide the queſtion are,

1ſt, The anſwer before made to the ſecond argument concerning amphitheatres.

(*) See the ſeventh chapter of the firſt book.

ɛtly, In the deſcription which Vitruvius gives of the baſilica, which he built at Fano, he ſays, it was contrived ſo as not to obſtruct the view of the temple of Auguſtus. This temple then muſt have been built before Vitruvius began building his baſilica. The baſilica muſt have been ſome time in building, and it muſt have been finiſhed before he wrote his books; yet the Emperor, to whom he dedicates his books, was but juſt peaceably ſettled in the government, as the proem to the firſt book clearly evinces. Theſe circumſtances therefore being compared, will not agree with the ſuppoſition that Auguſtus was the Emperor here addreſſed by Vitruvius. For it is not to be ſuppoſed that a temple was built to Auguſtus ſo long (as it muſt have been) before he was peaceably ſettled in the government; eſpecially as Auguſtus did not take that name till the third or fourth year after the battle of Actium. Beſides, Vitruvius mentions the name of Auguſtus without any term of reſpect; which he ſcarcely would have omitted if that Emperor had been then living; the rather as he held a place of profit and honour by his favour, and as in every other part of his books, where he names the reigning Emperor, he ſpeaks with reſpect, and directs his language to him perſonally. Farther, hiſtory informs us that two temples, and no more, were erected to Auguſtus, in that Emperor's life (one of which was at Lyons, and the other at Pergamus, in Aſia) as the ſpeech that Tiberius made, when Spain deſired leave to erect a temple to him, implies.

The tranſlator of Tacitus gives this ſpeech thus, "I know very well that many will condemn me for ſuffering Aſia to build me a temple, as Spain would do at preſent; but I will give my reaſons for ſo doing, and declare my reſolution for the future. The divine Auguſtus, whoſe words and actions are to me as ſo many inviolable laws, having conſented that the people of Pergamus ſhould dedicate a temple to him and the city of Rome, I thought I might follow ſo great an example, ſo much the rather as the honour intended me was joined with the veneration paid to the ſenate; but as, on the one hand, it might have been too great a piece of ſeverity to have denied it for once; ſo, on the other, doubtleſs, it would be too great a vanity to ſuffer one's ſelf to be adored as a God through all the provinces of the empire," &c.

This ſpeech evidently implies, that Auguſtus did not permit many temples to be erected to him; for had he done ſo, as Tiberius refuſed that honour, and called it a vanity, it would have been accuſing Auguſtus of vanity, whoſe words and actions he was ſo emulous to follow; and at the ſame time deviating from thoſe actions, by refuſing the honours which Auguſtus often permitted.

It is ſaid that after the death of Auguſtus, when Numericus Atticus pretended that he ſaw his ſoul aſcend to heaven, temples were every where erected to him; and Tacitus (B. 1. S. 72) ſays, that in the time of Tiberius a temple was built to Auguſtus at Taragon, in Spain, which ſerved as an example to all the other provinces. It is therefore moſt probable that it was at this time that the temple of Auguſtus, at Fano, was built; and, if ſo, Vitruvius muſt have wrote ſeveral years after the reign of Auguſtus.

Vitruvius, Book III. Chap. II. ſpeaks of a temple of equeſtrian fortune as ſtanding in his time, near the theatre of Pompey; and Tacitus, in his Annals, B. 3, S. 72, ſays, there was no temple of equeſtrian fortune in Rome, at the time of Tiberius; for which reaſon (he adds) the knights were obliged to go to Antium, to perform there ſome ſolemnity at the temple of that name. Vitruvius, therefore, muſt have wrote after the time of Tiberius. Indeed, Livy, B. 42, ſays, that a temple of that name was began by Q. Fulvius Flaccus, under the conſulate of Livius Poſthumus Albinus and Marcus Popilius Lenas, in the 580th year of Rome; but this temple was never dedicated, and therefore could not be uſed, and perhaps it was never finiſhed, as Fulvius died the following year.—See alſo note 8*, Chap. VI. Book V.

Vitruvius has fully deſcribed the conſtruction of hydraulic organs. Suetonius and Tacitus both agree that hydraulic organs were firſt known at Rome, in the latter part of Nero's reign. Suetonius, in the life of Nero, ſays, "that upon the news of the revolt of Vindex and Galba, Nero ſent for a few of the ſenators; and,

after a ſhort conſultation, took them to hear his hydraulic organs, a new and unknown kind of muſic, that played by water, telling them that he intended to introduce them upon the theatre, if Vindex would give him leave." Therefore, Vitruvius muſt have wrote after the reign of Nero.

The ſhort and tumultuous reigns of Galba, Otho, and Vitellius, following next, we cannot ſuppoſe that Vitruvius wrote in either of thoſe reigns, nor can we ſuppoſe him to have written in the reign of Veſpaſian; for many circumſtances will not agree with that ſuppoſition; particularly this, Vitruvius mentions a ſiſter of the Emperor's, whereas Veſpaſian had no ſiſter.

The reign of Titus followed next; and there is no circumſtance that I have met with, or can recollect, that diſagrees with the ſuppoſition, that Titus was the Emperor to whom Vitruvius wrote. On the contrary, there are many circumſtances which tend to confirm it, by rendering it probable that it was to none of the ſucceeding Emperors.

The fire that happened at Rome, in the laſt year of the reign of Titus, among many other buildings, deſtroyed the theatre of Pompey; and, though that theatre had ſeveral times before ſuffered by fire, yet we read of its having been reſtored again by divers Emperors; as by Tiberius, Claudius, &c. but after this fire we find it no more mentioned as ſubſiſting; we may therefore reaſonably conclude, that it was never after rebuilt; but, as Vitruvius mentions it as exiſting at the time he wrote, he muſt conſequently have wrote before this fire happened, and therefore not after the reign of Titus.

Frontinus, in his Treatiſe upon the Aqueducts of Rome, names Vitruvius; who muſt, therefore, have wrote before Frontinus publiſhed that treatiſe, which was in the reign of Trajan; and there being but the reigns of Nerva and Domitian between Trajan and Titus, and it being known that neither of thoſe Emperor's rebuilt Pompey's theatre, as alſo other circumſtances not agreeing, it becomes evident that Vitruvius did not write after the time of Titus; and, as the arguments before uſed make it equally certain (at leaſt in my opinion) that he did not write before that time, it remains of courſe highly probable that Titus was the Emperor to whom Vitruvius dedicates his books---But of this, every one may, from the above argument, form his own judgment.

I am here obliged to take notice of a circumſtance mentioned by Galiani in the Life of Vitruvius, prefixed to his tranſlation. He ſays, "that Vitruvius is not known to be mentioned by any claſſic writer, except Pliny, who names him in his catalogue of ancient authors; and by Frontinus, who mentions him as the author of the Quinarian Module, at the ſame time telling us that Auguſtus introduced that module."

The fact is, Pliny no where mentions Vitruvius, as I can find; the catalogue of ancient authors annexed to Pliny's Hiſtory was not made by Pliny, but by his commentator, Helvetius, who names Vitruvius in the ſaid catalogue of his own authority, as believing that Pliny copied Vitruvius in ſome paſſages, in which they both agree. I may for the ſame reaſon ſuppoſe that Vitruvius copied Pliny.

Frontinus, it is true, does mention Vitruvius, ſaying that ſome ſuppoſed him, and ſome Agrippa, to be the author of the Quinarian Module; but he no where ſays (as I can find) that it was introduced by Auguſtus, or in his reign.

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18	3	apricus	aphricus
23	32	oak, ſhingles,	oak ſhingles
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THE

ARCHITECTURE

OF

M·VITRUVIUS·POLLIO.

BOOK THE FIRST.

PROEM.

WHEN thy divine mind and genius, O Emperor Cæſar,[1*] firſt became poſſeſſed of the empire of the earth, and thou hadſt with invincible valour, ſubdued all thy enemies; thy citizens gloried in thy triumph and victory; all nations ſubjected, attended thy command; and the people and ſenate of Rome, delivered from fear, were governed by thy ſuperior wiſdom and judgment. I preſumed not then, when thou wer't ſo much engaged, to publiſh this treatiſe of Architecture, which I have with great ſtudy compoſed; fearing to incur thy diſpleaſure, by the unfitneſs of the time: But now, ſeeing thee attentive, not only to public affairs, and the general ſecurity of the ſtate, but alſo to the convenience of public edifices, (for by thee, Rome, the ſeat of the empire, has been adorned with public buildings, as well as enriched with provinces) I judged it right to delay no longer preſenting to thee theſe things; the rather, becauſe, being known to thy father, and admiring his virtues, when the celeſtial council of the Gods, had raiſed him to their immortal ſeats, and transferred to thy command, the empire of thy father, the veneration which I retained for his memory, procured me thy favour; wherefore, with M. Aurelius, P. Numidius, and C. Cornelius, I was appointed to the care and reparation of the baliſtas, ſcorpions, and other military engines, and with them receive the reward. This thou didſt firſt confer on me, in conſequence of thy ſiſter's commendation. Being therefore ſo greatly indebted to thy beneficence, and to the end of my life freed from the fear of want; I began to write for thee this treatiſe, having obſerved how much thou haſt built, and art now building; and foreſeeing the care thou wilt have in future of public and private edifices, that the memory of thy great atchievements may deſcend to poſterity. I have written theſe precepts with preciſion, that by their help, thou mayeſt judge of the works already done, or that ſhall be done hereafter; for in theſe books I have revealed all the principles of the art.

(1*) Which of the Roman emperors it was, whom Vitruvius here addreſſes, is a point not ſettled. See the Remarks on the Life of Vitruvius, prefixed.

CHAPTER I.

Of Architecture, and of the Inſtruction of Architects.

ARCHITECTURE is an art comprehending many ſciences and various kinds of erudition; by the rules of which, the works of all other arts are examined. It conſiſts of practice and theory.* Practice is the conſtant and accuſtomed attention to the manual operations, and to the ſeveral kinds of materials of which a work may be conſtructed. Theory is the ability to demonſtrate and explain the rules and reaſons of the proportions of buildings. Architects who have practiſed without theory, and who have been only experienced in the manual part, have not been able to acquire any reputation by their works; and thoſe who have truſted to theory and ſpeculation only, have followed the ſhadow and not the ſubſtance; but thoſe, who are perfectly acquainted with both, like men completely armed, ſpeedily, and with reputation, ſucceed in their endeavours; for as in all things, ſo eſpecially in architecture, there are two parts, the ſignified and the ſignifier; the former is that which is here propoſed to be treated of; the latter is the demonſtration of the principles of the ſciences explained; and he who profeſſes architecture, ought to be well exerciſed in both parts. He ſhould be ingenious, and docile of inſtruction; for neither ingenuity, without education, or education, without ingenuity, can render him a complete artiſt. He ought to have a knowledge of letters, be expert in drawing, learned in geometry, not ignorant of optics, inſtructed in arithmetic, well read in hiſtory, to have diligently attended to philoſophy, to have a knowledge of muſic, not a ſtranger to phyſic, underſtanding in the law, and be converſant in aſtronomy and the aſpects of the heavens; why theſe are neceſſary, the following are the reaſons.

An architect ſhould have a knowledge of letters, that he may be able to inſure the remembrance of his obſervations. By drawing, he is enabled to form the repreſentation of the work he would execute. Geometry is of great uſe to architecture, and teaches the uſe of the ruler and compaſs (which chiefly facilitates the delineation of the plans of buildings) and the management of ſquares, levels, and lines. By optics is aſcertained the region of the heavens, from whence buildings ſhould receive their light. By arithmetic, the expence of the edifice is calculated, the meaſures adjuſted, and the difficult queſtions of the ſymmetry ſolved. Architects ſhould be well acquainted with hiſtory, for they often introduce many ornaments in their works, whoſe original they ſhould be able to recite; as, for example, if

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(1*) The words of the text are *Fabrica & Ratiocinatione*, which moſt of the tranſlators have agreed in rendering practice and theory: but the definitions of Vitruvius, give us to underſtand, that by practice, he does not mean the actual labour of the workmanſhip, but the knowledge thereof only, ſo as to be able to direct the workmen, and to know when the work is well performed, and the materials good; as by theory he means the knowledge of the proportions, forms, diſtributions, &c. of the ſeveral parts of buildings, and their effects, ſo as to be able to deſign or compoſe with judgment.

marble ſtatues of women in garments, which are called Caryatides, ſhould be introduced in a building, ſupporting the mutules and cornice, inſtead of columns; when the reaſon is demanded, it may thus be given. Carya, a city of Peloponneſus, having joined with the Perſians againſt the Grecian ſtates, and the Greeks having put an end to the war by a glorious victory, with one conſent declared war againſt the Caryatides. They took the city, deſtroyed it, ſlew the men, and led the matrons into captivity, not permitting them to wear the habits and ornaments of their ſex: and they were not once only led in triumph, but were loaded with ſcorn, and kept in continual ſervitude, thus ſuffering for the crime of their city. The architects therefore of thoſe days, introduced their effigies ſuſtaining weights, in the public buildings, that the remembrance of the crime of the Caryatides might be tranſmitted to poſterity. The Lacedemonians, likewiſe, under the command of Pauſanias the ſon of Cleombrotus, having, at the battle of Platea, with a ſmall number vanquiſhed a numerous army of Perſians, to ſolemniſe the triumph, erected, with the ſpoils and plunder, the Perſian portico, as a trophy to tranſmit to poſterity the valour and honour of the citizens; introducing therein the ſtatues of the captives adorned with habits in the barbarian manner, ſupporting the roof. Thus with merited infamy they puniſhed pride, terrified their enemies with the idea of their power; and the citizens beholding this monument of their courage, were inſpired with a love of glory, and became more animated in the defence of their liberty. Hence it is that many introduce Perſian ſtatues ſuſtaining the epiſtylium[2*] and its ornaments, and thus make an excellent variety in their works. There are alſo other ſimilar hiſtorical facts, with which it behoves an architect to be well acquainted.

PHILOSOPHY enlarges the mind of an architect, frees him from arrogance, and renders him courteous, juſt, and faithful. Avarice he ſhould particularly avoid, for no work can ſucceed without fidelity and integrity. He ſhould never be covetous, or have his mind intent on receiving of gifts, but with prudence ſupport his proper dignity and reputation. All this philoſophy inculcates; it alſo teaches the nature of things, which the Greeks call *phyſiologia*, and which ought to be well underſtood, for many and various natural queſtions are ſolved thereby; as, for example, by the courſes, turnings, and different levels of the water in aqueducts, the natural ſpirits are excited, the ill effects of which, none can prevent, but thoſe who by the ſtudy of philoſophy have learnt the principles and nature of things. Alſo whoever would read the books of Cteſibius, Archimedes, or others who have written on ſuch kind of ſubjects, will not be able to underſtand them, unleſs he has been previouſly inſtructed in philoſophy. An architect ought to underſtand muſic, that he may know the canonical[3*] and mathematical rules of the proportions, and that he may properly regulate the force of the baliſtas, catapultas, and ſcorpions; for on either ſide of their little capitals, are the holes of uniſon, through which, with the capſtans or levers, the ſinewy cords are ſtrained, and not ſtopped, or faſtened, till the engineers perceive all their ſounds are alike; for when the

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(2*) Epiſtylium is a term ſometimes uſed to ſignify the whole entablature; as in this place, and at the 11th note of the following chapter; but it more generally ſignifies the architrave only. Among the other remains of antiquity at Athens, an example of the order of the Caryatides is ſtill ſubſiſting.

(3*) Canonical, alludes to a certain rule or ſcale, by which the ancients uſed to regulate the muſical intervals.

arms, which are held by theſe cords, are both equally ſtrained, they give the ſtroke properly; but if the cords are not in uniſon, the projectiles will vary, from their intended direction: ſo alſo the braſen vaſes in the little cells under the ſeats of the theatres, are diſpoſed by mathematical rules, and the diſtinctions of their tones, which the Greeks call *Echeiá*, are regulated by muſical concord and proportion, divided in the compaſs of diateſſaron, diapente, and diapaſon.* So that the ſound of the voice from the ſtage, ſtriking the correſpondent vaſe, reſounds, and becomes ſtronger, clearer, and more melodious, in the hearing of the audience: neither can the hydraulic organs,* and other ſimilar machines, be conſtructed without the knowledge of muſic.*

The ſtudy of phyſic is neceſſary, to be able to underſtand the nature of climates, which the Greeks call *Climata*, and whether the air and water of places are wholeſome or noxious, for without good air and water no habitation can be healthy.

It is requiſite to have a knowledge of the laws, which are neceſſary for the regulation of the walls of public buildings.* The gutters of the eaves, the ſhores, lights, water channels, and ſo forth, with which an architect ſhould be well acquainted, in order that he may be careful at the beginning of the building, not to leave the father of the family involved in controverſies after the work is finiſhed; and that the conditions be written with caution and equity, both with regard to the employer and the artificer; for when the conditions are juſtly deſcribed, both parties will remain free from altercation. By aſtronomy, is known the ſituation of the eaſt, weſt, ſouth, and north, the motions of the heavens, the equinoctial,

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(4*) The muſical intervals, called the fourth, fifth, and octave.

(5*) According to Tacitus and Suetonius, theſe organs were firſt known at Rome in the reign of Nero. See the Obſervations on the Life of Vitruvius, prefixed.

(6*) Galiani, in his notes on this paſſage, imputes the degeneracy of modern architecture, to the modern architects (in general) being ſo ignorant of muſic; and obſerves how greatly the ancients attended to it in proportioning their buildings, as may be inferred from the remains of their works; inſtancing in particular the ſepulchre of the ſervants of Auguſtus, as publiſhed by Bianchini, who ſhews how perfectly its proportions agree with thoſe of muſic.

Palladio, Alberti, and many others who have written on architecture, agree in the ſame opinion, and preſcribe the application of the muſical proportions to works of architecture.

There is great reaſon to believe, that the ſame proportions which are ſo pleaſing to the ear, will alſo pleaſe the eye, when applied to viſible objects. For nature acts by the eaſieſt and ſimpleſt means, and never varies the cauſe to produce the ſame effect, when the ſame cauſe will anſwer the end. In colours, nature uſes the ſame cauſe, and the ſame effect ariſes; their harmony conſiſting in the ſame proportions as prevail in muſical tones; why not therefore, in figures, in which caſe, the perceiver, the proportions perceived, and the ſenſe conveying thoſe proportions to the mind, are the ſame; and the only difference between this and the caſe of the muſical tones is, that the ſenſation of the proportions are conveyed to the perceiver by another conductor, (i. e.) another ſenſe? It may not therefore be wholly without reaſon to ſuppoſe, that the ſame proportions will have the ſame effect on either ſenſe, the eye, as well as the ear; in figures, as well as in ſounds and colours.

It may be obſerved, that the muſical concords are moſt pleaſing and harmonious comparatively, as their proportions are the ſimpleſt, compoſed of the loweſt numbers, and eaſieſt to be diſtinguiſhed; as, for example, the octave, which is, as one is to two, is a more perfect concord than the fifth, which is as two to three; and that laſt is more perfect than the fourth, which is, as three to four, *&c.* This obſervation then may ſerve as a hint to induce us (in caſe of uſing the muſical proportions in architecture, or in any regular objects) to prefer the ſimpleſt that will ſerve the purpoſe. See Note 6, Chap. I. Book II.

(7*) Galiani has obſerved, that the word *communis* ſhould be underſtood to ſignify exterior, and offers as proofs the places, where the ſame word is again mentioned; viz. at Chapter VIII. Book II. and Chapter IX. Book VI. I however cannot help underſtanding it differently, even in thoſe very places he quotes, and believe that the word *communis* is intended to ſignify common, or public. See the Notes at thoſe places.

the ſolſtices, and the order of the ſtars, without which knowledge, the art of dialling cannot be underſtood.

THIS art, therefore, being ſo extenſive, and enriched with ſo many various ſciences, I think none can on a ſudden juſtly profeſs themſelves architects, nor unleſs from their youth they have gradually ſurmounted theſe ſtudies, been nurſed in the knowledge of the many arts and ſciences, and thus have arrived at the perfect knowledge of architecture. Perhaps illiterate men may wonder how ſo many ſciences can be acquired and retained in the memory; but when it is conſidered that all the ſciences have a mutual connexion and communication, it will be more eaſily credited; for the whole circle of arts is as one body, compoſed of divers members; and thoſe who from their youth, are inſtructed in all the different arts, obſerve in them all an analogy and ſimilarity of principles, and find they are eaſily acquired. Hence the ancient architect Pythius, who erected the magnificent temple of Minerva, at Prienæ, ſays in his Commentaries, that an architect ought to excel in all arts and learning, thoſe who by their induſtry and practice, have brought things to their greateſt perfection. But that cannot be neceſſary; for an architect neither need be, nor can be, ſo good a grammarian as Ariſtarchus, though he muſt not be illiterate; nor a muſician like Ariſtoxenus, though not ignorant of muſic; nor a painter like Apelles, though not unſkilful in drawing; nor a ſtatuary like Miron, or Polycletus, though not a ſtranger to ſculpture; not as learned in phyſic as Hyppocrates, though not unacquainted with that art; nor need he be ſingularly excellent in any of the other ſciences, though he ſhould not be entirely without their knowledge; for in ſuch a number of different things, it is not poſſible to attain to ſingular perfection in each. It is ſcarcely in our power to conceive and underſtand their principles; nor is it architects alone who cannot arrive at this pitch of eminence in all literature; for even ſome of thoſe who have profeſſed a ſingle art, have not been able to obtain the higheſt degree of reputation. If, therefore, of all thoſe artiſts who practiſe only one art, very few, in an age, become remarkably excellent, how can it be expected that an architect, who ought to be ſkilled in many ſciences, ſhould exceed, or even equal, thoſe artiſts, who with great aſſiduity and induſtry have applied themſelves to a ſingle art?

In this, therefore, Pythius ſeems to have been miſtaken; not conſidering that every art conſiſts of two parts, the practice, and the theory; of theſe, one is peculiar to thoſe who exerciſe each particular art, viz. the practice; the other, which is the theory, is common to all the learned. So the pulſation of the veins, and the movement of the feet, are common to the profeſſors of both phyſic and muſic; but if a wound is to be healed, or a dangerous malady cured, a muſician is not employed, for it is the peculiar practice of a phyſician; and on the contrary, the muſician, and not the phyſician, muſt modulate inſtruments of muſic, ſo that our ears may be delighted with their ſounds. Between aſtronomy and muſic, there is likewiſe a common reaſoning, upon the ſympathy and ſymphony of the ſtars, in quadrate and trine, diateſſaron and diapente. In optics, by the Greeks called *logos opticos*, and in all other ſciences, there are many things ſimilar, or which have, at leaſt, the ſame common principles. But as to the executive part, in which practice and experience leads to perfection, it belongs to thoſe who are devoted to the exerciſe of one particular art. It is

therefore ſufficient for an architect to have a moderate knowledge of the parts and principles of the ſeveral arts which are aſſiſtant to the practice of architecture, that, if he ſhould have occaſion to judge of thoſe arts, or to examine a performance, he may not be found ignorant or deficient. Some there are to whom nature has given ſo much ſagacity, penetration, and memory, that they are able to acquire a complete knowledge of geometry, aſtronomy, muſic, and many other ſciences; theſe exceed the department of architects, and become mathematicians. Being therefore furniſhed with ſo much knowledge, they can with facility diſcourſe on many ſubjects; but even among theſe there rarely happens to be ſuch men as Ariſtarchus of Samos; Philolaus, and Architas, the Tarentines; Apollonius of Pergeus; Eratoſthenes of Cyreneus; Archimedes and Scopinas of Syracuſe; who have left to poſterity many mechanical and gnomonical inventions, which, by their knowledge of numbers, and the laws of nature, they have diſcovered and explained.

As therefore ſuch talents and natural abilities are not granted to all men, but to very few, and as the profeſſion of an architect requires that he ſhould be acquainted with all erudition, though, on account of the extenſiveneſs of ſcience, it is admitted that a perfect knowledge of all is not to be expected, and that a moderate degree is ſufficient, I requeſt indulgence from thee, O Cæſar, and thoſe who read my books, if any thing ſhould not be here deſcribed according to the ſtrict rules of grammar, for I pretend not to write like an eminent philoſopher, an eloquent rhetorician, or excellent grammarian practiſed in the principles of the art; but as an architect, moderately acquainted with letters. So far, therefore, as the art and the rules thereof will admit, I promiſe, (as I hope) that theſe books will be written to the ſatisfaction, not only of profeſſors, but of the learned in general.

CHAP.

CHAPTER II.

Of what Architecture conſiſts.

ARCHITECTURE conſiſts of Ordination, which the Greeks call *taxis*; of Diſpoſition, which the Greeks call *diatheſin*; of Eurithmy, Symmetry, Decor, and Diſtribution, which the Greeks call *oiconomiâ*. Ordination[1*] is the proper modification of the members of the work, ſeparately, and the regulation of the whole proportion and ſymmetry. This ariſes from quantity, which the Greeks call *poſotes*. Quantity relates to the meaſures uſed in the ſame work, and the ſuitable effect of the ſeveral members, and of the whole building. Diſpoſition[2*] is the apt collocation of the parts, producing the proper qualities in the compoſition of the work; the kinds of diſpoſition, by the Greeks called *ideai*, are theſe, Ichnography[3*], Orthography[4*], and Scenography[5*]. Ichnography is the uſe of the compaſſes and ruler, in deſcribing the horizontal figures of objects. Orthography is the delineation of the front, according to the true meaſures of the intended work. Scenography is alſo the repreſentation of the front, with the ſide receding in ſhadow, and all the lines tending to a central point. Theſe ariſe from cogitation and invention. Cogitation is profound reflection, joined with induſtry and vigilance, delighting to produce the deſired effect. Invention is the ſolution of intricate queſtions, and the diſcovery of novelties. Theſe are the limits of diſpoſition.

EURITHMY[6*] conſiſts in the beautiful form and handſome appearance of the members of a compoſition. This is effected when the heights of the members are adapted to their breadth, and their breadth to their length, each being correſpondent to the ſymmetry

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(1*) All the commentators of Vitruvius allow this explication of architecture to be very dark and unintelligible; and all differ in their interpretation thereof; its obſcurity may very likely be owing, in a great degree, to our ignorance of many circumſtances of thoſe times, their uſe of the technical terms, or the different acceptation of words. The words are here put together in ſuch a manner, as ſeem to us to have no coherence or ſenſe; we can, therefore, do no more than make conjectures concerning their true meaning, guided by the little aſſiſtance they will afford us.

Ordination I ſupppoſe to be uſed in the ſenſe we now uſe the word order; it expreſſes the kind of compoſition employed in the building, as the Doric kind, the Ionic, or Corinthian kinds, &c. It may be ſaid to relate to quantity, becauſe the order governs the proportional magnitude of the parts; for, according to the kind or order of building uſed, the parts are varied in their proportional magnitude.

(2*) Diſpoſition here ſeems to be uſed by Vitruvius, in the ſenſe of compoſition; he mentions this latter word in his definition. Diſpoſition, in the ſenſe we generally accept it, is included in the article of Diſtribution, hereafter defined.

(3*) The art of drawing the geometrical plans of objects.

(4*) That of drawing their geometrical elevations.

(5*) The art of drawing their perſpective appearances.

(6*) Eurithmy, by the deſcription of Vitruvius, anſwers to proportion, which is the harmonious correſpondence of the height, breadth, and length of objects, and the agreement of the parts with each other, and with the whole.

of the whole. Symmetry[7*] is alſo the proper agreement of the ſame members of a work, and the proportional correſpondence of the ſeparate parts to the form of the whole object; as in the human body, the arm, the foot, the palm, the finger, and the other members are in ſymmetry. And ſo it muſt be in all perfect works, but particularly in ſacred edifices; as in the thickneſs of the columns, the order of the triglyphs, the holes of the balliſtæ, which the Greeks call *peritreton*, or the interſcalmii[8*] of galleys, called *dipechaice*, and in ſimilar works; in all which, the members are regulated by the rules of ſymmetry.

Decor[9*] conſiſts in the proper appearance of a work, and its being compounded of approved and authoriſed parts. This has regard, either to ſtation,[10*] which the Greeks call *thematiſmos*, cuſtom; or nature. To ſtation, when temples which are erected to Jove the thunderer, the heavens, the ſun, or the moon, are built uncovered, and expoſed to the air, becauſe the influences and effects of thoſe deities are perceived in the open air; when to Minerva, Mars, Hercules, Doric temples are built; for on account of the attributes of theſe deities, edifices conſtructed without delicacy are moſt ſuitable. To Venus, Flora, Proſerpine, and the nymphs of the fountains, the corinthian kind are erected with propriety; for by reaſon of the delicacy of thoſe goddeſſes, the graceful, gay manner, with foliage, and ornamented volutes, give a due decorum to the work. To Juno, Diana, Bacchus, and ſuch other deities, Ionic temples are conſtructed, as poſſeſſing the mediocrity; for being tempered of the ſeverity of the Doric, and the tenderneſs of the Corinthian, they become moſt ſuitable. Decor, with regard to cuſtom, is obſerved when the internal parts of edifices being magnificent, the acceſſes are alſo made ſuitable and elegant; for if the interior parts are elegant, and the approaches are mean and ignoble, it will not have decor. So likewiſe if denſils are carved in the cornice of the Doric epiſtylium,[11*] or in the abacus of the capital, or if triglyphs are repreſented in the epiſtylium of Ionic collumns, transferring the characteriſtics of one kind of work to another; it offends the eye, becauſe cuſtom has eſtabliſhed a different order of things. Decor, with regard to nature, conſiſts in all temples being placed in a ſalutary ſituation, with fountains of water in the places where the ſane is built; but eſpecially, the temples of Eſculapius, of Health, and ſuch deities, by whoſe healing influence numbers of ſick appear to be recovered. For the diſeaſed bodies being removed from an unhealthy to a healthy ſituation, and the ſalutiferous water of the fountains

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(7*) The definitions of eurithmy and ſymmetry, are very ſimilar; proportion ſeems to be the meaning of both. Vitruvius frequently uſes the words proportion and ſymmetry, ſynonimouſly; and his definitions and applications of thoſe words, give us to underſtand, that the only difference he makes between them, is, that the former ſignifies the proportion of each member in itſelf, (that is, the proportion which the height, length and breadth bear to one another) and the latter, the proportion of one member to another, and to the whole object. Vitruvius alſo uſes the word ſymmetry in the ſenſe of manner, arrangement, formation, configuration, &c. and in the third and fourth Books, he uſes it for order, ſaying, the Doric or Ionic ſymmetry, &c.

(8*) *Interſcalmii*, are the intervals of the oar holes in galleys.

(9*) Decor, I judge to be propriety. As eurithmy and ſymmetry produce beauty, ſo decor is that which produces the appearance of propriety, and ſelects the qualities and appendages becoming the object.

(10*) *Statione*, Galiani has rendered *ſtatute*, and Perault, *the ſtate of things*. I have tranſlated it ſtation, judging by the ſenſe of the context, that Vitruvius means the ſtation, rank, quality, office, or dignity of the perſon for whom a building may be erected; or, if a temple, the attributes, power, or department of the deity to whom it is dedicated.

(*11) Epiſtylium is evidently here uſed to ſignify the whole entablature.

being adminiſtered, they are ſoon reſtored. By this means it will happen that the natural effects of the place will encreaſe the received opinion of the power of the Divinity.

DECOR, with regard to nature, is alſo obſerved when chambers and libraries receive their light from the eaſt; baths, and winter aparments, from the winter weſt; picture galleries, and ſuch apartments as require a ſteady light, from the north, becauſe that region of the heavens is rendered neither lighter nor darker by the courſe of the ſun, but is equal and immutable the whole day.

DISTRIBUTION[12*] conſiſts in the proper diſpenſation and application of the materials, obſerving moderate œconomy with regard to the expence of the work. This will happen, if the architect does not require materials that cannot be obtained, or procured, unleſs at a great charge; for there are not plenty of pit-ſand, ſtones, fir, ſappinus[13*], or marble in all places; but ſome grow in one place, and ſome in another; and to procure ſome, it may be difficult or expenſive. Where therefore there is no pit-ſand, river, or waſhed ſea ſand muſt be uſed; and for want of fir, or ſappinus, the cypreſs, poplar, elm, or pine may be made uſe of; and ſo in other ſimilar caſes.

ANOTHER part of diſtribution is the adapting the building to the convenience of the owner, his fortune, rank, or dignity; it is alſo found to be neceſſary to conſtruct the dwelling houſe[14*], different from the ruſtic buildings deſtined for the preſervation of the fruits of the earth. The houſes of traders, different from thoſe of the rich and delicate. But for perſons in power, by whoſe councils the republic is governed, things muſt be diſpoſed to their uſe; always making the diſtribution of edifices ſuitable to every proprietor.

(12*) Vitruvius gives the word diſtribution a very different ſignification, to that we now generally allow it. He applies it to the diſpoſal and choice of the materials; and alſo, to adapting the building to the fortune, dignity, and uſe of the owner; which latter ſeems rather to belong to the province of decor, as he has before explained it: it however may be conſidered as belonging to both; for a building cannot be ſaid to be well diſtributed, unleſs it is ſuited to the owner; neither can it have propriety or decor, without being ſo ſuited.

(13*) Sappinus is the name the Romans gave to the lower part of the ſtem of the fir tree, which being moſt free from knots, was prepared in a particular manner, and reſerved for the inſide work. See Vitruvius, Book II. Chap. IX. and Pliny, Book XVI. S. XVI.

(14*) I differ from former tranſlators in my conception of this paſſage. They have conſtrued it as if meant to oppoſe a city houſe to a country houſe; I underſtand it, as oppoſing one part of the country houſe to another part (i. e.) the dwelling, or maſter's part, to the farming and huſbandry part. The ancient villas contained three parts; one was called the *urbana*, or part where the maſter and his family dwelt; the other the *ruſtica*, deſtined for the uſes of huſbandry; and the third, the *fructuaria*, or receptacle for the fruits of the earth. I am therefore of opinion, that the words *urbanas domos*, allude to the maſter's part, as *poſſeſſionibus ruſticis* do to the huſbandry part of the villa. For, as theſe were well known terms for thoſe different parts of the villa, it is to be ſuppoſed, that Vitruvius would have choſen ſome other words to diſtinguiſh his meaning, if he had meant any thing elſe by them.

Vitruvius alſo diſtinguiſhes *poſſeſſionibus ruſticis*, from *urbanas domos*, by the former's being deſtined for the reception of the fruits. Now, that not being the chief purpoſe of the whole country houſe, but only that of an inferior part, it cannot properly be uſed to diſtinguiſh the purpoſe of a country houſe, in oppoſition to that of a city houſe; but, is perfectly proper to diſtinguiſh between the farming part, and the dwelling, or maſter's part of the villa.

CHAPTER III.

Of the Parts and Principles of Architecture.

THE parts of architecture are three; Building, Dialling, and Mechanics. Building is divided into two parts, of which one relates to fortification and the conſtruction of public works; the other is relative to private edifices. The diſtributions[1*] of public works are three; one is defence, another, religion, and the third is convenience. Defence regards the erection of the walls, towers, and gates, which are to be contrived ſo as conſtantly to repel the aſſaults of an enemy. Religion, the ſacred edifices and temples of the immortal Gods; and convenience, the common buildings for the public uſe; ſuch as the Port, Forum, Porticos, Baths, Theatres, Ambulatories, and ſuch like; which therefore are always diſpoſed in public places. All theſe ought to be conſtructed with ſtrength, utility, and beauty. They will have ſtrength when their foundations are ſunk to the ſolid earth; and when from plenty of materials, a careful choice is made without ſparing. Utility, when the apartments are properly diſtributed, without obſtruction to their uſe, and are expoſed to the aſpects which are convenient and adapted to their reſpective purpoſes. Beauty, when the form of the work is agreeable and elegant, and the proportions of the members are correſpondent to the rules of ſymmetry.

(1*) Vitruvius, in this place, uſes the word diſtribution in the ſenſe of the word deſtination. I have here choſen to make uſe of the word of the text, in order to give the reader an idea of the various and unuſual ſignifications in which the words are often uſed.

CHAPTER IV.

Of the Choice of healthy Situations.

BEFORE the walls of a city is began, a healthy ſituation ſhould be choſen; it ſhould be elevated, not cloudy or rainy, and turned to that aſpect of the heavens which is neither hot nor cold, but temperate. The neighbourhood of marſhes is alſo to be avoided; for at ſun-riſe when the breezes of the morning, joined with the riſing clouds, paſs over the city, the venemous effluvia of the vermin in the marſhes, mixed with the clouds, being blown and diffuſed among the bodies of the inhabitants, renders the place unhealthy. Cities likewiſe that are ſituated on the ſea-coaſt, and expoſed to the ſouth or weſt, will not be healthy; becauſe in the ſummer, the morning ſun heats, and the meridian ſcorches the ſouthern aſpects. So alſo if they are expoſed to the weſt, they are warmed at ſun-riſe, heated at noon, and ſcorched in the evening; ſo that by the variations of heat and cold, things in thoſe places are ſoon vitiated. This may alſo be obſerved in inanimate objects; for in covered wine vaults, no one admits the light from the ſouth or weſt, but from the north, becauſe this aſpect never ſuffers any change, but is always ſteady and immutable. For this reaſon, in granaries that are expoſed to the ſouth, the foods and fruits which are not depoſited in a part that is defended from the heat of the ſun, are not long preſerved; for heat always dries and deſtroys the conſiſtence of things, and the fervid vapours extracting the natural moiſture, diſſolves, ſoftens and renders them ſpiritleſs. This we obſerve even in iron, which though hard in its nature, yet being intenſely heated by the fiery vapours of the furnace, is ſo ſoftened as to be eaſily wrought in all kinds of forms, and when it is thus ſoft and burning hot, if it is cooled again by being ſteeped in water, it is rehardened and reſtored to its former ſtrength. It may likewiſe be obſerved, that in ſummer (not only in noxious, but even in healthy places) all bodies are infeebled by the heat; and by the winter, even the moſt peſtilential places are rendered healthy, becauſe they are rectified by the cold; alſo bodies that are conveyed from cold to hot climates, cannot exiſt, but are diſſolved; on the contrary, thoſe that go from hot places to the cold northern regions, are not only recovered from their diſeaſes, but are alſo invigorated. We ſhould be careful therefore, not to expoſe cities to thoſe regions which may diffuſe hot blaſts among the bodies of the inhabitants; for of the elements, which the Greeks call *Stoicheia*, all bodies are conſtituted; that is, of fire, water, earth and air; and theſe, variouſly mixed and tempered by nature, produce the different properties of all animals in the world. Thoſe bodies in which the element of fire predominates, are thereby diſſolved and deſtroyed; which evil is cauſed by the heat from certain parts of the heavens, entering the pores in a greater quantity than ſuits the natural temperament of the body. So alſo if too much humidity occupies the veſſels of the body, it occaſions an inequality, and the moiſture corrupts, dilutes, and deſtroys the virtue and texture of the other elements; even the cold humidity of the winds and air infuſes diſorders in the body.

The ſame may be ſaid of air and earth, the augmentation or diminution of which, in the natural conſtitution of the body, diſorders the other elements; earth, by too much food; and air, by the denſity of the atmoſphere.

But whoſoever would ſenſibly perceive theſe things, muſt obſerve, and conſider the nature of birds, fiſh, and the terreſtial animals; and he will diſcern their diſtinct temperatures; for the ſpecies of birds have one conſtitution, fiſh another, and the terreſtial natures another far different. The winged animals have little earth and water, a moderate degree of fire, and much air; being therefore compounded of the lighter elements, they eaſily ſuſtain and move themſelves in the air. The aquatic animals, or ſpecies of fiſh, are compounded of a moderate degree of fire, much air and earth, and very little moiſture; ſo that having but a ſmall portion of the element of water in their bodies, they can more eaſily exiſt therein, and when they are brought to land, they relinquiſh their life with the water. The terreſtial animals are conſtituted of the elements of fire and air, of little earth, and much moiſture; abounding therefore in humidity, they cannot long exiſt in water. If, therefore, things appear to be formed in the manner we have explained, and we allow that animal bodies are compounded of theſe elements, the exceſs or deficience of which cauſes diſorder, we cannot doubt of the care that ought to be uſed, to elect the moſt temperate aſpects, when we deſire cities to be healthily ſituated. We ſhould, moreover, recall to mind the rules of the ancients, who inſpected the livers of the ſacrificed cattle which had fed in the places where a town or abiding camp was to be eſtabliſhed; and if the firſt was livid, or corrupt, they ſacrificed others; doubting whether diſeaſe, or bad paſturage had occaſioned it. When they had tried many, and had proved that the healthy and ſound ſtate of the livers proceeded from the goodneſs of the water and paſturage, they there erected their fortification; but if the livers were found vitiated, it indicated that the ſame diſeaſes would in future ariſe in the bodies of men, from the uſe of the water and vegetables of thoſe places. They therefore removed to other countries, changing places, and ſeeking health above all other things.

That the peculiar ſanity of a ſpot is to be diſcovered by the paſturage and produce, may be obſerved and known, from the example of the country about the river Pothereus, in the iſland of Crete. The river is ſituated between the two cities Gnoſon and Cortynam; and upon the right and left the cattle feed; but thoſe that feed next Gnoſon have a milt; and thoſe on the other ſide, next Cortynam, have no appearance of any. The phyſicians, upon ſearching after the cauſe, diſcovered in thoſe places certain herbs, on which the cattle feeding, diminiſhed their milt; upon this, they collected thoſe herbs, and make uſe of them as a medicine to cure the ſpleen, which herb the Cretans therefore call *aſplenon*. From this example it may be concluded, that the vegetables and water of countries naturally occaſion them to be noxious or healthy.

Cities that are built in lakes, near the ſea, and expoſed to the north, or between the north and eaſt, provided the lake is higher than the bed of the ſea, will not be ill ſituated; for by making trenches, the water will run off to the ſea-ſhore; and the ſea when

ſwoln[1*] by tempeſts reflowing into the lake with violent motion, and mingling with the ſtagnated water, will not ſuffer any kind of vermin to breed; for ſuch vermin as breed in higher places, upon coming near the ſea-coaſt are deſtroyed by the unaccuſtomed ſaltneſs. Examples of this kind are the Gaulic lakes, which are near Altina, Ravenna, and Aquileja. There are alſo other towns in the neighbourhood of lakes, which are for this reaſon, incredibly healthy; but ſuch lakes as, like the Pontinæ[2*], are ſtagnant, and have no efflux, either by rivers, or trenches, become putrid, and emit groſs and peſtilential vapours in thoſe places. The ancient city of Salapia, in Apulia, which was founded by Diomedes, at his return from Troy, or, as ſome write, by Elphias, the Rhodian, was diſpoſed in ſuch a place, that the inhabitants were every year afflicted with diſeaſes; at laſt they applied to M. Hoſtilius, and, in the name of the public, requeſted, that he would ſearch for, and elect them a proper place to which they might transfer their city. To this he conſented, and without delay, ſought, according to the moſt approved methods, for a healthy ſpot upon the ſea-coaſt; purchaſed the poſſeſſion; petitioned the ſenate and people of Rome for leave to transfer the town; raiſed the walls, divided the areas, and then, for a ſeſtertius each, gave free poſſeſſion to the citizens. This done, he opened the lake to the ſea, made it the port, and ſo perfected the city. The Salapines therefore now inhabit a healthy ſituation, four miles diſtant from their old town.

CHAPTER V.

Of the Conſtruction of the Walls and Towers.

WHEN therefore, by the above means, the ſituation choſen for the city is found to be ſalutary, the ſoil fertile, yielding food ſufficient for the ſuſtenance of the inhabitants, and the approaches eaſy, or having the accommodation of a river, or ſea-port, to expedite the carriage of goods to and from the city; then the foundations of the towers and walls are to be thus conſtructed: the ground is to be dug down to the ſolid earth, and in the ſolid, ſo far as ſeems reaſonable for the magnitude of the work. The foundation walls are to be thicker than thoſe which are built above ground, and they muſt be executed in the firmeſt manner.

(1*) There are little or no tides in the Mediteranean ſea; to which Vitruvius had chiefly regard; he therefore ſuppoſes that ſea to be raiſed only by tempeſts.

(2*) Pontinæ was a lake in the Campania, eighteen miles diſtant from Rome.

On the outſide, towers (D) are erected, that when enemies hoſtily approach the walls, they may be wounded by the darts from the towers, on their right and left; particular care is to be taken that the aſſailants may not eaſily advance to batter the walls, encompaſſing the place with a ditch, and contriving the approaches to the gates, not to be direct, but *ſcaia*[1*]; for when they are thus made, the right ſide of the beſiegers, which is not covered with a ſhield, will be expoſed to the walls. *Fig. I.*

Cities are not to be formed quadrangularly, or with projecting angles, but circuitouſly[2*], that the enemy may be deſcried from many parts: for thoſe projecting angles are difficult to defend, and are a greater ſecurity to the enemy than to the city. The thickneſs[3*] of the walls I judge ſhould be ſuch, that when the armed men happen to meet, they may paſs each other without obſtruction[4*]. In the thickneſs, olive piles ſcorched, and ranged very cloſe, are laid; ſo that the walls having both fronts thus bound together, are exceſſively ſtrong: for this wood is not affected, either by the weather, rot, or age; but whether it is buried in the earth, or ſunk in the water, it remains always ſound and ſerviceable. If, therefore, not only the walls above ground, but alſo the foundations, and other thick walls, were united in this manner, they would not ſpeedily decay.

The diſtances[5*] of the towers (D) are ſo regulated as not to be greater than the darts will reach; that in caſe of an aſſault, the enemy may be repulſed by the ſcorpions and other miſſiles from the towers on the right and left. Alſo oppoſite to the interior part (E) of the towers the wall is to be divided, the interval being as large as the tower; and the paſſage way (F) in that place is to be made with timber, and not faſtened with iron; that if the enemy ſhould gain that part of the walls, it may be cut by the beſieged ſo ſpeedily, as not to permit the aſſailants to penetrate farther without precipitating themſelves. The towers are made either round or polygonal; for the machines ſoon deſtroy thoſe which are made ſquare, and their angles are broke by the battering rams. But the round, like wedges driving to their center, cannot be eaſily damaged. *Fig. I.* *Fig. IV.*

(1*) *Scaia*, ſignifies oblique, or inclining to the left. See the letters C, C, Fig. I.

(2*) Vitruvius's word is *circuitionibus*, by which, I do not ſuppoſe he means that cities are always to be upon the plan of a circle, or any regular polygon; but that they ſhould be convex in every part, though their figure may be various and irregular, according as their ſituation, the nature of the adjacent country, or other circumſtances may make proper.

Several of the tranſlators have in their draughts, repreſented the city upon the plan of an octagon, dodecagon, &c. placing the towers at the angles only. Vitruvius, a little farther on, ſays, that the diſtance of the towers from each other ſhould not be greater than the throw of a dart, which we may ſuppoſe was about eighty or a hundred feet; as the towers which Julius Cæſar erected at the ſiege of Bourges, were at that diſtance. It follows, therefore, that the cities, according to the ſuppoſition of the ſaid tranſlators, muſt be included within the periphery of eight or twelve hundred feet; which, though large enough for a fortreſs, or citadel, would make but a very diminutive city.

(3*) In the ancient manner of fortification it was uſual to make a paſſage in the thickneſs of the walls, near the top, open with arches next to the town, and having ſmall apertures next to the enemy. In this paſſage, as well as on the top of the wall, the ſoldiers were poſted for the defence of the place. Such a paſſage is ſtill to be ſeen in the remains of the ancient walls of Rome, built by the emperor Aurelian. See b, b, in the plan and elevation, Fig. IV.

(4*) Vitruvius ſays, the walls ſhould be ſo thick that the ſoldiers may paſs each other with eaſe; but it muſt be ſuppoſed that he means excluſive of the thickneſs of the battlements, which defend and ſcreen the men from the enemy.

(5*) Julius Cæſar, at the ſiege of Bourges, erected turrets eighty feet apart, as before mentioned. See D, D, Fig. I.

IF a bulwark (H, I,) is adjoined to the walls and towers, it will render them more ſecure; for they cannot then be much annoyed either by the rams, mines, or other machines; though it is not neceſſary to make theſe bulwarks in all places; but only where there is ſome elevated place without the walls; from whence the city may be eaſily aſſaulted. In thoſe places, therefore, a ditch of a great breadth and depth is firſt to be dug; in which the foundations of the walls are laid, and built of ſuch a thickneſs, that they may eaſily ſuſtain the preſſure of the ground. On the inſide of the ſubſtruction, another foundation (G) is laid, at an ample diſtance inwardly from the exterior, ſo that the cohorts may be contained and exerciſed on the breadth of the bulwark. When theſe foundations are built thus diſtant from each other, then between them other tranſverſe walls (H, H,) are built, joining the exterior and interior foundations; being diſpoſed like the teeth of a comb, (I, I,) or in the manner of a ſaw (H, H,). For when they are ſo made, the great maſs of earth, being diſtributed into ſmall parts, cannot act with its united weight, or be able to force out the foundation walls.

BUT the materials of which theſe walls ſhould be built, cannot be determined; becauſe in all places we cannot have plenty of the beſt materials; where free-ſtone, flints, rubble, or bricks, burnt or unburnt, can be obtained, they muſt be uſed; for all places have not the advantage of Babylon, where there is an abundance of a liquid bitumen, which ſerves inſtead of lime and ſand, and the walls are built with burnt bricks. But all countries, or places, may have their peculiar advantages, and ſome kind of ſubſtances, with which, by theſe methods, the walls may be made durable, and without defect.

CHAPTER VI.

Of the Diviſion and Diſpoſition of the Works within the Walls.

THE walls being finiſhed, the next thing is the diviſion of the area within the walls, and the direction of the ſtreets and lanes to the proper regions of the heavens. Theſe will be properly directed, when thoſe winds are judiciouſly excluded from the ſtreets, which, if

(6*) Perault, Galiani, and Barbaro, have ſuppoſed this bulwark to be as high as the top of the wall. In the foremention̄ed example of the walls of Rome, ſome remains of ſuch a bulwark are ſtill to be ſeen, by which it appears, that it was raiſed only one ſtory high from the level of the city, in the manner of a terras. See H, G, Fig. I, and IV.

(7*) Adjoining to that part of the walls of Rome, where anciently ſtood the *Caſtro di Tiberio*, are yet to be ſeen the remains of walls diſpoſed like the tranſverſe walls here deſcribed, and were probably for the ſame purpoſe. Theſe tranſverſe walls, and part of the city wall adjoining, was rebuilt by Conſtantine, having been deſtroyed, together with the Caſtro, in the war between him and Maxentius.

cold, offend; if warm, corrupt; and if humid, are infectious; care therefore ſhould be taken to avoid this evil, which in many cities uſually happens. The town of Mitylene, in the iſland of Leſbos, is magnificently and elegantly built, but injudiciouſly diſpoſed. In this city, when Auſter blows, the inhabitants are ſick; when Corus, they have coughs; and when Septentrio, they are reſtored to health; but they cannot then remain in the lanes and ſtreets, on account of the ſeverity of the cold. Wind is only a current of air, flowing with uncertain motion; it ariſes from the action of heat upon moiſture; the violence of the heat forcing out the blaſts of air. That this is the fact, the braſs œolipyles make evident: for the latent operations of the heavens and nature may be diſcovered by the action of artificial machines. Theſe braſs œolipyles are hollow, and have a very narrow aperture, by which they are filled with water, and then placed on the fire. Before they become hot, they emit no effluvia; but as ſoon as the water begins to boil, they ſend forth a vehement blaſt; ſo that from this little eaſy experiment, we are able to judge of the cauſes of the great and mighty winds of heaven, and of the works of nature. If then a city is thus defended from the winds, it is not only rendered ſalutary to bodies in health, but alſo thoſe diſeaſes, which have ariſen from the malignity of other places, and which require the application of medicines, in this are ſoon removed by the means of the temperate ſtate of the air. The maladies which are cured with difficulty in the places abovementioned are, colds, the gout, coughs, pleuriſies, conſumptions, the emiſſion of blood, and ſuch like; which are not cured by diminution, but by augmentation. The reaſon theſe are with difficulty remedied, is, firſt, becauſe they are occaſioned by cold; and ſecondly, becauſe the diſeaſe having already impaired the ſtrength, the air agitated and attenuated by the motion of the winds, extracts the juices from the diſeaſed bodies, and thus renders them ſtill weaker. On the contrary, mild denſe air, not in frequent fluctuation, or redundance, nouriſhes and reſtores the members of thoſe, who are afflicted with ſuch infirmities.

Some will not allow that there are more than four winds; *ſolanus*, the equinoctial eaſt; *Auſter*, the ſouth; *Favonius*, the equinoctial weſt; and *Septentrionus*, the north. But there are found to be eight, by thoſe who have more attentively conſidered the ſubject. Of theſe Andronicus Cyrrheſtes is the chief; who, as an example, built at Athens, an octogonal tower of marble; and on the ſeveral ſides of the octogon carved the images of the ſeveral winds; diſpoſing each oppoſite to its reſpective region: on the top of the tower he erected a marble metæ, upon which he placed a triton of braſs, with his right hand extended, holding a wand, and ſo contrived that it was turned by the wind, always ſtanding oppoſite to the blaſt, and holding the wand over the image of the wind that then blew.* There is therefore, between Solanus and Auſter, Eurus, or the winter eaſt; between Auſter and Favonius, Aphricus, or the winter weſt; between Favonius and Septentrionus, Caurus, which many call Corus; and between Septentrionus and Solanus, Aquilo; and in this manner they are

(1*) In a French tranſlation of Vitruvius, by Jean Martin, in 1572, there is a deſign of this tower of Andronicus Cyrrheſtes; but ſince the publication of the ruins of Athens, by Mr. Stuart, we have the ſatisfaction of ſeeing the true and accurate draught of the original.

deſcribed, that the number and names of the ſeveral winds, and the parts from whence they blow, may be clearly underſtood.

Fig. I. and II. HAVING thus far premiſed, to diſcover their regions and ſources, this is the method. A marble compaſs exactly levelled, is placed in the middle of the city, or elſe the place itſelf ſo well poliſhed and levelled, as to render a compaſs unneceſſary. In the center of this place is fixed a metal gnomon to caſt a ſhadow, which the Greeks call *Sciatheras:* about the fifth hour[2*] in the forenoon, the extremity of the ſhadow of the gnomon is obſerved, and marked with a point; then with the compaſſes extended ſo much as is equal to the length of the ſhadow of the gnomon, a line is circumſcribed round the center. In the afternoon alſo the encreaſe of the ſhadow is obſerved; and, when it touches the circular line, making the afternoon ſhadow equal to that of the forenoon, another point is made. From theſe two points deſcribing an interſection with the compaſſes, and from that interſection producing a line through the central point to the extremity, the ſouthern and northern regions are found. After this, taking with the compaſſes the ſixteenth part of the whole circumference of the circle, and placing the central foot in the meridian line, where it touches the circumference, marks are made therewith on the circle to the right and left, both on the ſouthern and northern ſide. Then from theſe four points, lines are drawn through the center, from extremity to extremity of the circumference, interſecting each other; thus the ſouth and north have each an eighth part aſſigned them; the remaining parts are equally diſtributed in the whole circumference, three to the right, and three to the left, according to the eight equal diviſions of the winds. This done, the directions of the ſtreets and lanes are diſpoſed in the angles, between every two winds; as, by this method, the habitations will be defended from their hurtful and offenſive violence. For when the ſtreets are diſpoſed directly oppoſite to the winds, the impetuous blaſts that frequently deſcend from the open ſpace of heaven, being confined in the narrow entrances of the ſtreets, fly through them with greater violence. But when the direction of the ſtreets are turned from the region of the winds, the blaſts, meeting with the angles of the iſlands of houſes,[3*] are broke, repulſed, and diſſipated.

Fig. II.

PERHAPS, thoſe who know the many names of winds, will wonder that we have deſcribed no more than eight; but if they conſider that the circumference of the earth is, by the courſe of the ſun, and the ſhadow of equinoctial gnomons, ariſing from the inclination of the heavens, found by Eratoſthenes Cyreneus, according to mathematical rules and geometrical proceſs, to be two hundred and fifty two thouſand ſtadiæ; which make thirty-one million five hundred thouſand paces, and that the eighth part of this which is occupied by each wind, is three million nine hundred and thirty-ſeven thouſand five hundred paces, they will

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(2*) The Romans divided the day into twelve hours, beginning from ſun-riſe; as the night alſo conſiſted of twelve, beginning from ſun-ſet; the fifth hour, therefore, in the forenoon, muſt be about one hour before noon, or, as we expreſs it, eleven of the clock.

(3*) A pile of houſes, or buildings ſurrounded by ſtreets, was called an iſland. Suet. Life of Nero.

not wonder that one wind ranging in ſo great a ſpace, ſhould make various inflections, returns, and changes.

Auster, therefore, has on his right and left, Euronotus, and Altanus; Apricus has Libonotus, and Subveſperus; Favonius has Argeſtes, and at certain times Eteſiæ; Caurus has on either ſide Circius, and Corus; Septentrio has Thraſcias, and Gallicus; on the right and left of Aquilo, are Supernas, and Boreas; Solanus has Carbas, and at certain times Ornithiæ; Eurus, occupying the middle part, has on either ſide Cæcias, and Volturnus. There are many other names of winds derived from countries, rivers, or mountains; there are alſo the Auræ Matutinæ, which the ſun, when it riſes from the ſubterranean regions, acting violently on the humid air, forces out from the vapours of the dawn; theſe remain after the ſun is riſen, holding the part of the eaſtern winds, which for this reaſon appear to have been called Euros by the Greeks; as alſo, the morning, from theſe Auræ Matutinæ, they called Aurion. Some there are who deny that Eratoſthenes could compute the true meaſure of the earth; but ſuppoſing that to be the caſe, it does not invalidate our deſcription of the regions from whence the ſeveral winds ariſe, but only renders the juſt meaſure of the ſpace occupied by each wind, indeterminable, and uncertain.

To illuſtrate and facilitate the conception of theſe things, which are but briefly explained, two figures, or, as they are called by the Greeks, *Schemataæ*, are placed at the end of the book: one is contrived to ſhew the regions, from whence the ſeveral winds ariſe; the other, to ſhew the manner of diſpoſing the lanes and ſtreets, ſo as to avoid their noxious blaſts.

Fig. II. The center of the level plain is ſhewn by the letter A, the ſhadow of the gnomon in the forenoon is at B. Extending the compaſſes to the mark of the ſhadow at B, deſcribe a circle. Let the gnomon remain, and wait while the ſhadow decreaſes, and again encreaſes, till the afternoon ſhadow is equal to that of the forenoon, and touches the line of the circle at C. Then extending the compaſſes from B to C, deſcribe an interſection D, and from that interſection, continue a line through the center to the letters E and F, at the extremities; this line will indicate the ſouthern and northern regions. Then with the compaſſes, taking the ſixteenth part of the whole circumference, and putting the central foot in the meridian line, where it touches the circumference at E, make marks to the right and left, where the letters G and H are placed. On the north ſide alſo, ſetting the central foot of the compaſſes in the circle, at the north line, where F ſtands, mark to the right and left, where the letters I and K are placed; draw lines from G to K, and from H to I, paſſing through the center. Thus the ſpace from G to H, will be the province of the wind Auſter, and of the ſouthern regions; as the ſpace from I to K, will be that of the northern. The remaining parts, three to the right, and three to the left, are equally divided; thoſe to the eaſt are marked with the letters L and M, and thoſe to the weſt with N and O; from M to O, and from L to N, lines are drawn, interſecting each other, and thus the circle will be divided into the eight equal ſpaces of the winds.

(4*) The morning breezes.

When it is thus described, these letters will stand at the several angles of the octogon, beginning at the meridian. Between Eurus and Auster, the letter G; between Auster and Aphricus, H; between Aphricus and Favonius, N; between Favonius and Caurus, O; between Caurus and Septentrio, K; between Septentrio and Aquilo, I; between Aquilo and Solanus, L; and between Solanus and Eurus, M. This being compleated, the gnomon is fixed between the angles of the octogon, and thus the IIX[5*] divisions of the streets and lanes are directed.

CHAPTER VII.

Of the Situation of the Public Buildings.

THE lanes and streets being divided and disposed, the situation of the squares, temples, forums, and the other public buildings, for the convenience and common use of the city, is next to be explained. If the city is near the sea, the area designed for the forum should be chosen near the port; but in an inland place, it should be situated in the middle of the town (A). The temples of those deities that are the tutular guardians of the city; as also those of Jupiter, Juno, and Minerva; are to be situated in an elevated place, from whence the greater part of the city is discoverable; the temples of Mercury are placed in the forum, or in the emporium; as are those of Isis, and Serapis; those of Apollo, and Bacchus, are near the theatre; that of Hercules, in such cities as have no gymnasiæ, nor amphitheatre,[1*] is to be built near the circus[2*]; that of Mars, without the city, but near the camp; that of Venus, also at the gate; for it is written in the doctrines of the Etruscan Aruspices, that[3*] the fanes of Venus, Vulcan, and Mars, should be placed without the walls; that the youth and matrons may not be accustomed to the sight of libidinous pleasures; and

Fig. I.

(5* IIX) Signifies two less than ten, that is eight.

(1*) It was the custom of the Gladiators, when they were excused any farther performance in public, to hang up their weapons in the temple of Hercules; which, therefore, was usually adjoining the place of performance; whether it was an amphitheatre, or circus.

(2*) Vitruvius here mentions amphitheatres, and circus's, but gives us no description of either. See the Observations on the Life of Vitruvius.

(3*) Some of the translators observe, that these rules for situating temples were not always observed; for Julius Cæsar built a temple to Venus, within the city, as Augustus also did to Mars; but in both these instances it may be considered that there were particular circumstances, which might be the reason of deviating from the general custom. Julius Cæsar boasted of being descended from Venus; and Augustus erected this temple to Mars, as his patron and protector, in consequence of his gaining the victory at the battle of Phillipæ. These emperors, therefore, considering those deities as their particular patrons, might be the reason of their giving them place within the city, contrary to the common usage.

that of Vulcan being placed without the city, contributes to ſecure the buildings from fire, by calling out the religious rites and ſacrifices of that god. So when the fane of the god Mars is dedicated without the city, it is thought no civil diſſentions will happen therein, but it will be defended from its enemies, and the dangers of war. The temple of Ceres is alſo ſituated without the city, in a place which men do not frequent, except at the time of the ſacrifices; for with devotion, chaſtity, and purity of manners, this temple ſhould be approached. The other deities have their temples ſituated in places ſuitable to the forms of their ſacrifices.

But the rules for building ſacred edifices, and the ſymmetry of their plans, are given in the third and fourth books. For it appears to me proper, previouſly to treat in the ſecond book, of the materials neceſſary to be prepared for buildings, and of their qualities and uſes; and in the ſeveral books to explain the proportions of the ſeveral kinds of buildings, their ordination, and ſymmetry.

THE END OF THE FIRST BOOK.

THE ARCHITECTURE OF *M·VITRUVIUS·POLLIO.*

BOOK THE SECOND.

PROEM.

AT the time that Alexander was conquering the world, Dinocrates,(1*) the architect, confiding in his knowledge and genius, and being desirous of obtaining the royal commendation, left Macedon, and repaired to the army. He carried with him letters from his relations and friends in his own country, to the nobles of the first rank, that he might thereby more easily gain access. Being favourably received, he requested to be immediately presented to Alexander; they gave him many promises, but made delays, pretending to wait till a proper opportunity should offer. Dinocrates, therefore, suspecting that he was derided, sought the remedy from himself. He was very large of stature, had an agreeable countenance, and a dignity in his form and deportment. Trusting to these gifts of nature, he clothed himself in the habit of an host, anointed his body with oil, crowned his head with boughs of poplar, put a lion's skin over his left shoulder, and holding one of the claws in his right hand, approached the tribunal where the king was administring justice. The novelty of the appearance attracting the notice of the people, occasioned Alexander also to see him, who, wondring at the sight, commanded way to be given, that he might approach. Alexander then demanded who he was; Dinocrates replied, I am a Macedonian architect, who comes to thee with ideas and designs, worthy of the greatness of thy fame; I have formed a design to cut mount Athos into the statue of a man, in whose left hand shall be a large city, and in his right, a bason, which shall receive all the rivers of the mountain, and again discharge them to the sea. Alexander delighted with the idea, immediately enquired, if the country adjacent would produce sufficient food for the sustenance of the inhabitants. When he understood that provision must be conveyed thither by sea, he replied; Dinocrates, I discern the excellence of thy design, and am pleased with it; but I consider, that whoever should establish a colony in such a place, would hereafter be justly blamed; for, as a new born

(1*) This architect is called by Pliny, B. 5. S. 11. *Dinochares*; and by Plutarch, in the Life of Alexander, *Stasicrates*; by some *Chinocrates*; and by others, *Chironocrates*.

infant cannot be nouriſhed, or gradually reared to the different ſtages of life, without the milk of the nurſe; ſo neither can a city be peopled, nor can it thrive, without fertile land and plenty of proviſion: however, as I approve the deſign, though I diſapprove the place, I will have thee attend me, that elſewhere I may employ thee. From that time, Dinocrates remained with the king, and attended him into Egypt. There Alexander, obſerving a ſpot which had an haven formed ſecure by nature, an excellent place for an emporium, the adjacent country through all Egypt being fruitful, and having the accommodation of the river Nile, ordered him to build the city now called from his name Alexandria. Thus, by the means of a graceful countenance and dignity of perſon, Dinocrates became eminent. But to me, O emperor, nature has not given greatneſs of ſtature; age has deformed my face, and infirmity has impaired my ſtrength; being therefore deprived of thoſe advantages, I endeavour, by the help of my knowledge and writings, to merit commendation.

As in the firſt book, I have ſpoken of the uſe of architecture, and the conſtituent parts of the art, the fortifications, and the diviſion of the area within the walls, it follows, as next in order, that the proportion and ſymmetry of temples, and public as well as private edifices, ought to be explained; but I judge it moſt proper to defer their deſcription, till I have previouſly diſcourſed on the ſeveral materials of which buildings are conſtructed; the rules for working them, their qualities, and the elements of which they are by nature conſtituted; and before I begin to explain the nature of theſe things, I ſhall ſpeak of the uſes of buildings, their origin, and how they were invented; alſo of the ancient ſtate of things; and whatſoever I have learnt from thoſe who have wrote on the origin of civil life, and uſeful inventions.

CHAP.

CHAPTER I.

Of the Original of Buildings.

IN ancient times, men, like wild beaſts, lived in foreſts, caves, and groves; feeding on wild food, and in that manner ſpending their time. In a certain place it once happened, that the trees, being agitated by tempeſtous winds, rubbing their branches one againſt another, took fire. Thoſe who were near the place, affrighted at the violent conflagration, fled; but afterward, as the flames abated, reſuming courage, they approached nearer, and finding the heat to be very comfortable to their bodies, they threw more wood into the decreaſing fire, and thus preſerved it. They then invited other men, making ſigns to them, to expreſs their opinion of its convenience. Men, thus aſſembled, made various ſounds with their voice; and by daily practice, ſome certain ſounds, by which they ſignified the things in frequent uſe, obtained, and became eſtabliſhed. From this caſual event language aroſe; and hence they began to converſe together. Fire, therefore, having thus occaſioned men to aſſemble, diſcourſe, and live together, by having attracted many to one place, they ſoon obſerved that they were by nature ſuperior to other animals; as not being prone, but walking erect, beholding the beauties of the earth and the heavens; alſo that, by means of their hands and fingers, they could eaſily make any thing they pleaſed; they, therefore, began to make themſelves coverings with the boughs of trees; ſome dug caves in the mountains; and others, in imitation of the neſts of ſwallows, with ſprigs and loam, made ſhelters which they might lie under; and by obſerving each other's work, and turning their thoughts to diſcover ſomething new, they by degrees improved and made a better kind of habitations. But men being of an imitative and docile nature, glorying in their daily inventions, and ſhewing one another the houſes they had made, they, by theſe endeavours and exertions of their faculties, became in time more ſkilful.

AT firſt, to ſerve for the walls, they erected forked ſtakes, and diſpoſing twigs between them, covered them with loam; others piled up dry clods of clay, binding them together with wood; and to avoid the rain and heat, they made a covering with reeds and boughs; but finding that this roof could not reſiſt the winter rains, they made it ſloping, and pointed at the top, plaiſtering it over with clay, and by that means diſcharged the rain water. That the origin of things was, as above written, may be concluded from obſerving that to this day, ſome foreign nations conſtruct their dwellings of the ſame kind of materials; as, in Gaul, Spain, Luſitania, and Aquitain, they uſe oak, ſhingles, or ſtraw. The Colchians, in the kingdom of Pontus, where they abound in foreſts, fix trees in the earth cloſe together, in ranks to the right and left, leaving as much ſpace between them, as the length of the trees will permit; upon the ends, others are laid tranſverſely, which circumclude the place of habitation in the middle; then, at the top, the four angles are braced together with

alternate beams; and thus the walls, by fixing other trees perpendicularly on thoſe below, may be raiſed to the height of towers. The interſtices which, on account of the coarſeneſs of the materials, remain, are ſtopped with chips and loam. The roof is alſo raiſed by beams laid acroſs from the extreme angles, gradually converging, and riſing from the four ſides to the middle point at the top, and then covered with boughs and loam. In this manner, the barbarians make the teſtudinal roofs of their towers. The Phrygians, who inhabit a champaign country, being deſtitute of timber, by reaſon of the want of foreſts, ſelect little natural hills, excavate them in the middle, dig an entrance, and widen the ſpace within as much as the nature of the place will permit; above, they fix ſtakes in a piramidal form, bind them together, and cover them with reeds, or ſtraw, heaping thereon great piles of earth. This kind of covering renders them very warm in winter, and cool in ſummer; ſome alſo cover the roofs of their huts with the weeds of lakes; and thus in all nations and countries, the dwellings are formed upon ſimilar principles. At Marſeilles, we may obſerve the roofs without tiles, and covered with earth and ſtraw; at Athens, the Areopagus is at this day an example of the ancient roofs of loam; at the Capitol alſo, the houſe of Romulus[1*], in the ſacred citadel, may remind us of the ancient manner of covering our roofs with ſtraw. By theſe examples, therefore, we may be aſſured, that the firſt invention of building happened in the manner we have related; but at length, mankind by daily practice improved, and by repeatedly exerciſing their faculties and talents, arrived at the full knowledge of the art; thoſe who were moſt experienced profeſſing themſelves artificers. When, therefore, theſe things were thus far advanced, as Nature had not only given to mankind ſenſe in common with other animals, but had alſo furniſhed their minds with judgement and foreſight, and had ſubjected other animals to their power, they, from the art of building, gradually proceeded to other arts and ſciences, and from a ſavage and ruſtic way of life, became humane and civilized. Then, when their minds were thus enlightened, and they became more judicious by experience, and the advancement of the various arts and ſciences, they no longer built huts, but founded houſes, with walls conſtructed of bricks, ſtones, or other materials, covering the roofs with tiles. Hence by application to the arts, they, from wandering, and uncertain opinion, arrived at the certain knowledge of the laws of ſymmetry; obſerving alſo, that nature afforded a great variety of timber, and other materials fit for building, they availed themſelves of that advantage, and thus improving in the arts, they extended them to encreaſe the pleaſures and elegancies of life. I ſhall therefore, as well as I am able, treat of the proper application of the ſeveral materials, and of their natures and qualities.

In caſe ſome ſhould object to the order of this book, and be of opinion that it ought to have been placed firſt, I ſhall here give my reaſon for believing I have not erred in that

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(1*) The houſe of Romulus was a hut, which was built on the Capitoline hill. It was not the reſidence of Romulus, for it is certain that he dwelt on mount Palatine; the Capitoline not being included within the walls, at the firſt building of the city. This hut the Romans religiouſly obſerved never to repair with any other materials than reeds and ſtraw, in commemoration of their founder.

reſpect. As I propoſe writing a full Syſtem of Architecture, I judged it proper, in the firſt book, to mention the learning and ſcience with which that art ſhould ever be accompanied; to determine the extent of its nature, and of what parts it conſiſts; ſpecifying all the knowledge that is required in an architect: as, therefore, I have in the firſt book deſcribed the uſe of the art; I ought in this, to explain the qualities and uſes of the materials: for this book treats not only of the origin of architecture, but alſo of the inſtitution of buildings; from what cauſes they ſprang, and gradually attained their preſent perfection. This, therefore, is the proper place and order of this book.

Now, returning to our ſubject, to diſcourſe explicitly concerning the materials uſed in buildings, of the manner in which they are found to be generated by nature, and what elements are united in their compoſition. For no kind of materials, or ſubſtances, can grow, without the mixture of the elements. Neither can they be underſtood or explained according to the doctrine of phyſics, unleſs their cauſes are known, and the manner, and reaſon why they ſo exiſt, is demonſtrated.

CHAPTER II.

Of the Principles of Things, according to the Opinion of Philoſophers.

THALES believed water to be the principle of all things; and Heraclitus, of Epheſus, who, from the obſcurity of his writings, is called by the Greeks, *Scotinos*, fire; Democritus, who is followed by Epicurus, atoms; which we call indiſectible; others individual corpuſcles; for the philoſophy of Pythagoras adds air and earth, to water and fire. Democritus, therefore, did not properly deſcribe things; but nevertheleſs ſuppoſed individual corpuſcles, as appears by his own words, and which, when disjoined from each other, are incapable of injury, decay, or diviſion; but muſt eternally endure, and retain their ſolidity. As, therefore, all things ſeem to be conſtituted, by the combination of theſe atoms, and are divided into an infinite number of different kinds, I think it not unneceſſary to treat of the varieties and divers properties of thoſe which are uſed in buildings; that, when they are known, thoſe who intend to build may not miſapply them, but properly adapt the materials of buildings to their ſeveral uſes.

CHAPTER III.

Of Bricks.

I SHALL firſt ſpeak of bricks, and the earth of which they ſhould be made. They ſhould not be made of ſandy, ſtoney, or gravely loam; for ſuch kinds of earth, in the firſt place, render them heavy; and, ſecondly, upon being wetted with the rain, after they are laid in the wall, they ſwell and diſſolve; and the ſtraw which is put in them, does not adhere on account of their roughneſs. Bricks ſhould be made of earth that is white and chalky, or red, or having a maſculine[1*] large ſand; for theſe kinds being light and ſtrong, are not weighty in working, and are laid with facility. They ſhould alſo be made in the ſpring, or autumn, as being the beſt time of drying; for thoſe made in the ſummer, are not ſound, on account of the intenſe heat of the ſun, which parches the outſide, before the inſide is ſufficiently dry; which afterward drying in the building, cauſes them to ſhrink and break others which were dry; by that means rendering the ſtructure infirm, and full of fractures. They are beſt when made two years before they are uſed; for they cannot be ſufficiently dry in leſs time. If they are uſed when newly made, and moiſt, the plaiſter work which is laid on them, remaining firm and ſtiff, and they ſhrinking, and conſequently not preſerving the ſame height with the incruſtation, it is by ſuch contraction looſened and ſeparated; by this means the plaiſtering breaks, and falls from the building; for, on account of its thinneſs, it cannot ſtand of itſelf; and the walls themſelves are ſometimes damaged thereby. At Utica, therefore, the laws allow no bricks to be uſed before they have lain to dry five years, as muſt be proved to the magiſtrates, by whoſe authority they may then be uſed for the building of walls.

Fig. V. THERE are three ſorts of bricks; one which the Greeks call *Didoron*, which are ſuch as we uſe; they are a foot long, and half a foot broad. The other two ſorts are uſed in the buildings of the Greeks; one of which they call *Pentadoron*, and the other *Tetradoron*; for the Greeks call the palm *Doron*, becauſe a gift which is always preſented with the palm of the hand, is in Greek called *Doron*; thoſe bricks, therefore, which have on every ſide five palms, are called *Pentadoron*, and thoſe which have four, *Tetradoron*; in public works they uſe the former; and in private, the latter. Of theſe bricks *Fig. VIII.* they alſo make half bricks; and in working, the whole bricks (a) are placed in one courſe, and the half bricks (b) in the other. So that when both parts are built to a level, they appear to be laid in the walls with alternate faces outward, the middle of the bricks being diſpoſed perpendicularly over the joints, giving ſtrength, and not

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(1*) It is not known what kind of ſand Vitruvius means by the words *Maſculo Sabulone*. Several of the commentators have given their conjectures concerning it; but none appear ſatisfactory, or worth mentioning.

an unhandſome appearance to both parts.[2*] At Calentum, in the farther Spain; at Marſeilles, in Gaul; and at Pitane, in Aſia; there are bricks which, when made and dried, will ſwim, if thrown into the water. The reaſon they ſwim is, becauſe the earth of which they are made, is pumicoſious, and replete with air, not receiving or imbibing the water; being therefore light and porous, and not ſuffering the water to penetrate into its ſubſtance; however large the maſs may be, the bricks, in the ſame manner as pumice ſtones, are ſuſtained on the water. The Calentines have therefore a great advantage; for theſe bricks are not weighty in the building, and when once made, cannot be impaired by the weather.

CHAPTER IV.

Of Sand.

IN all cementitious buildings, the firſt thing to be conſidered is the ſand; it ſhould be ſuch as will mix well in the mortar, and have in it no mixture of earth. The kinds of pit-ſand are, the black, white, red, and carbuncle; of theſe, ſuch as crackles upon being rubbed in the hand, are the beſt; for ſuch as are earthy have not that aſperity; ſuch alſo as, being thrown on a white garment, do not ſoil it, or leave any dirt thereon, are good. But in places where there are no pits, ſand muſt be procured by ſifting of gravel, or taken from rivers, as well as from the ſea-ſhore; but this latter is not good for building, becauſe it dries with difficulty, and walls wherein it is uſed cannot be built without intermiſſions of reſt, nor will they bear the preſſure of arched floors; alſo in buildings where the walls are plaiſtered, the ſalts exuding from ſea-ſand, diſſolves the plaiſtering; whereas buildings in which pit-ſand is uſed, quickly dry, the incruſtation ſtands firm, and the walls will ſuſtain

(2*) Vitruvius does not mention the thickneſs of the bricks; the ancients made their bricks very thin, almoſt like tiles, as appears by their remains. The thickneſs, therefore, might be an eſtabliſhed meaſure, or dependent on the ſuperficial magnitude of the brick.

The bricks, *Tetradoron*, and *Pentadoron*, uſed by the Greeks, were ſquare, having, as Vitruvius ſays, every ſide equal, each ſide of the former meaſuring four palms, and of the latter, five. The *Didoron* bricks, which the Romans uſed, were oblong, being a foot long, and half a foot broad; that is, four palms long, and two broad, which is exactly equal to half a *Tetradoron* brick. As, therefore, the Greeks made half bricks of each of the ſorts which they uſed; the half *Tetradoron* bricks of the Greeks were exactly ſimilar to the *Didoron* bricks of the Romans, and might be laid in the ſame manner, and make juſt the ſame appearance in the work.

Barbaro, Alberti, and ſome others, have ſuppoſed theſe half bricks were made by dividing the whole brick diagonally, ſo that they become triangular; of which kind ſome are ſtill to be ſeen in the remains of the walls of Rome, in that part particularly which was built by the emperor Aurelian; but it is evident that Vitruvius does not here mean that triangular ſort, but a quadrangular kind, made by dividing the whole brick quadrilaterally; for he ſpeaks of their appearing to be laid in the wall with alternate faces outward; thereby implying that the faces were of different dimenſions, which is not the caſe of the two ſides of ſuch triangular bricks. The diagonal ſide is indeed of a different dimenſion from the other two; but it cannot be probably ſuppoſed that Vitruvius means that ſide to be uſed alternately with the others; its meaſure being ſo diſproportionate and incongruous to the ſquare ſides, that they can never be made to agree together in any regular order.

the weight of the arches. Sand ſhould be uſed freſh from the pit; for if it lays long expoſed, it is, by the action of the ſun, moon, and rain, diluted, weakened, and made earthy; and, if then uſed in any ſtructure, it will not conſolidate the materials, which therefore ſeparate and fall, rendering the walls unable to ſuſtain their burthen. But though pit-ſand is ſo well adapted for building of walls, it is not proper for incruſtations; for, on account of its fatneſs, which cauſes a violent fermentation when mixed with the lime and ſtraw, it will not dry without cracking. But river ſand, by reaſon of its meagreneſs, being beaten with ſtaves like ſiguinum,* makes the plaiſtering ſtrong and durable.

CHAPTER V.

Of Lime.

SAND having been ſufficiently explained, lime muſt alſo be properly conſidered; it ſhould be burnt from white ſtone, or flint, of which the thick and hard ſort are more proper for building walls, as thoſe which are porous are for plaiſtering. When the lime is burnt, the ingredients are thus to be mixed; with three parts of pit-ſand, one part of lime is to be mingled, but if river or ſea-ſand is uſed, two parts of ſand, with one of lime, muſt be united; for in theſe proportions the mortar will have a proper conſiſtence: if bricks, or tyles, pounded and ſifted, be joined with river or pit-ſand, to the quantity of a third part, it will make the mortar ſtronger, and fitter for uſe. The reaſon that lime, when ſaturated with water and ſand, conſolidates the materials, ſeems to be this: ſtones, as well as all other ſubſtances, are compounded of the elements; thoſe which have moſt air, are tender; thoſe which have moſt water, are, by reaſon of their humidity, tenacious; thoſe which have moſt earth, are hard; and thoſe which have moſt fire, brittle. If theſe ſtones were only pounded into minute pieces, and mixed with the ſand without being burnt, they would not indurate, or unite; but when they are caſt in the furnace, and there penetrated by the violent heat of the fire, they loſe their former ſolidity; and being calcined and deprived of their ſtrength, they are left exhauſted, and full of pores. The water and air, therefore, which are in the ſubſtance of the ſtones, being thus diſcharged and expelled, and the latent heat only remaining, upon being repleniſhed with water, which repels the fire, they recover their vigour, and the water entering the vacuities, occaſions a fermentation; the ſubſtance of the lime is thus refrigerated, and the ſuperabundant heat ejected. But the ſtones, when

(*) Siguinum, is, according to Pliny, Book 35, C. 12, a kind of mortar made with lime, mixed with broken tyles, or earthen veſſels, beaten very ſmall. Vitruvius himſelf, in Book 8, Chap. 7, ſays, it is made with pure rough ſand, and lime made of flint-ſtones. Galiani writes, ſand, lime, and flint-ſtones; but I think he miſtakes the ſenſe of the paſſage.

taken out of the furnace will not be of the ſame weight they were before they were burnt; for, if weighed, though the magnitude will remain the ſame, they will be found to be decreaſed in weight, by the evaporation of the humidity, about a third part. When, therefore, their pores and cavities are again ſaturated with ſand, they unite and dry together, and by that means conſolidate the materials.

CHAPTER VI.

Of the Earth of Pozzuoli.[1*]

THIS is a kind of earth that naturally produces admirable effects: it grows in the territory of Baiæ, and in the municipal lands about the mountain Veſuvius: being mixed with lime and bricks, it not only renders common buildings exceedingly ſtrong, but alſo ſtrengthens moles which are built in the ſea; for it preſently ſets, and becomes hard, under the water. The reaſon of this appears to be, that as under all this mountain and country adjacent there are great fires of burning ſulphur, alum, or bitumen, as may be known by the many hot ſprings thereabout, the flaming vapours ariſing from theſe internal fires, pervading and burning in the interſtices, render the earth light, and the ſand that grows there dry, and without moiſture. When, therefore, theſe three things, all ariſing from a ſimilar cauſe, viz. the intenſe heat of fire, are blended together, upon receiving water they ſpeedily unite, and, by means of the humidity, ſoon become hard and ſolid; nor can the waves, or utmoſt violence of the water, ſeparate them. That there is fire in thoſe places, is indicated by theſe circumſtances: in the mountains of Cumæ and Baiæ, ſweating caves are dug, from the bottom of which iſſues a fervid vapour, which by means of its heat perforates the earth, and ſprings forth in thoſe places; making excellent and uſeful ſudatories. It is moreover reported, that in former times the fire increaſed and ſuperabounded under the mountain Veſuvius, from whence a flaming matter was ejected around the country, which matter is now called the pompeianian ſponge, or pumice. This appears to be formed of various kinds of ſtones burnt, and reduced to that ſtate and quality; for ſuch ſpongy kind of ſtones grow in no other places, except about mount Ætna, the Myſian hills, named by the Greeks *Catacecaumenoi*, and in ſuch kind of places. Since, therefore, ſprings of hot water

(1*) This earth of Pozzuoli, is now called Pozzolana ſand; it was firſt found in the neighbourhood of Pozzuoli, anciently called Puteoli, from whence it derived its ancient name Pulvere Puteolano; it is a kind of red earth very much reſembling pounded bricks, or tyles; and, indeed, I have reaſon to believe, from my own experience, as well as from the accounts I have received from others who have made the trial, that pounded bricks or tiles, as Vitruvius preſcribes in the former chapter, being mixed with the lime and ſand, and well beaten, will in a great meaſure anſwer the end of the Pozzolano ſand.

are found in theſe places, fervid vapours ariſe in the caves of the mountains, and we know by tradition that theſe ſame countries were formerly overſpread with fire, it cannot be doubted that the ſand and earth are deprived of their moiſture by the heat of fire, in the ſame manner as lime is in the furnace. Theſe different and diſſimilar things, therefore, being effected by the ſame acting power, receive a ſimilar heat and drineſs of nature; and upon being ſuddenly ſaturated with water, the latent heat occaſioning a violent fermentation in the common maſs, cauſes them to unite, and ſpeedily acquire a conſolidating property.

One queſtion remains; viz. that ſince there are in Tuſcany many hot-ſprings, how happens it that the earth which thus cements ſtructures under the water, is not to be found there alſo? As this queſtion requires an anſwer, the explanation muſt not be omitted. In all countries, the earth is not of the ſame nature, nor do the ſame kind of ſtones grow; in ſome places they are earthy, in others ſandy, or gritty; in ſome, gravelly; and in others, of different and various qualities, according to the various properties of the earth: as, for example, it may be obſerved, that the countries of Italy and Tuſcany, which are ſurrounded by the Appennine mountains, have no want of ſand-pits near every part; but beyond the Appenines, on the ſide next the Adriatic ſea, none are to be found; alſo in Achaia, Aſia, and beyond ſea, in general, they are unknown. So likewiſe, in all places where ſprings of hot water ariſe, the ſame properties may not concur, for they all proceed from the natural conſtitution of things; no ways depending on the will of men, but being fortuitouſly generated. Wherever, therefore, the mountains are not earthy, but are of a petrifiable kind of ſubſtance, the heat of the fire iſſuing forth through the interſtices, endurates the parts, burning whatever is ſoft and inflamable, and leaving only what is hard and incombuſtible. As, therefore, in the Campania, the burnt earth becomes Pozzuoli ſand; ſo in Tuſcany, the ſoil is by heat turned to the carbuncle kind of ſand; both are excellent for building, but one is moſt proper for ſtructures on land, and the other for moles, and thoſe which are built in the ſea; the Tuſcan ſoil is by nature ſofter than gravel, and harder than earth; wherefore, by the violent heat of the ſubterraneous vapours, which exhale in ſome places, the ſpecies of ſand, called carbuncle, is there generated.

CHAPTER VII.

Of Stone Quarries.

Having ſpoken of the ſeveral kinds of ſand and lime, and alſo of their qualities, it follows next to treat of the quarries, from whence the hewn, as well as the rubble ſtones, for edifices, are extracted; theſe are found to be different and various in their nature; for ſome are ſoft, as the red kind near the city, and thoſe of Pallienſis, Fidenæ and Albanæ; others are moderately hard, as the Tiburtine, Amiternine and Soractine; and ſome are very hard,

as are thoſe of flint; there are alſo divers other kinds; as, in the Campania, the red and black gravel; in Umbria, Picæno, and Venice, the white ſtone, which may even be cut with a ſaw, like wood; but all the ſoft kinds, though they afford this conveniency, that the ſtones when extracted, are wrought with facility, and if ſituated under ſhelter, will anſwer the end; yet, if they are left uncovered, and expoſed to the weather, they will be ruptured and diſſolved by the froſt and rain; alſo, if they are near the ſea-coaſt, they will be corroded by the ſalts; neither will they bear heat.

On the contrary, the Tibertine ſtones, and thoſe of the ſame kind, will bear all the injuries of the weather, as well as the burthen laid upon them, but are not proof againſt fire; for, if they are heated by it, they ſplit, and ſhiver to pieces; for they are naturally tempered of a ſmall portion of water and earth, and much air and fire. When, therefore, they are expoſed to the action of fire, the internal vapours being rarified and expelled, the fire eaſily enters the vacuities, burning, and giving their ſubſtance a ſimilar degree of heat; but there are many ſtone quarries, on the confines of Tarquinium, called Anitianæ, of the colour of the Albanian, the pits laying chiefly about the Vulſinian lake[1*], in the prefecture of the Statonienſi, which are of an excellent quality, for neither froſt nor fire can hurt them; and they endure, and remain ſound to a great age; for they are naturally tempered of an equal portion of air and fire, a moderate quantity of water, and much earth; ſo that, being ſolid and compact, they ſuffer neither from the weather, nor the violence of fire. This is particularly proved by the monuments, near the town of Ferentum, which are built of theſe ſtones, and in which there are large ſtatues excellently wrought, as well as ſmaller figures, flowers, and Acanthus leaves, elegantly carved; which, though old, appear as perfect as if lately made; the braſs workers alſo, prepare their molds for founding, from the ſtone of this quarry, and find it exceeding ſerviceable: if it was near the city, it ought to be made uſe of in all works[2*].

But as their vicinity makes it neceſſary to uſe the quarries of red ſtone, and thoſe of Pallienſis, which are near the city, it is proper to mention how theſe materials ſhould be prepared.

When an edifice is intended to be built, they ſhould be extracted from the quarry two years before they are to be uſed; not in winter, but in ſummer; and muſt be left laying in uncovered places; thoſe which, in the two years, have been injured by the weather, are uſed in the foundation; the others, which are not damaged, being thus proved by nature, will alſo remain unhurt, when they are laid in the ſuperſtructure. This method is to be obſerved not only in ſtructures of hewn ſtone, but alſo in all cementitious buildings[3*].

(1*) Now called *Lago Bolſeno*.

(2*) Tacitus informs us that Nero, after the fire which happened in his reign, ordered the houſes to be rebuilt with Albian and Gabian ſtone, which would endure the heat of fire unhurt.

(3*) Cementitious buildings are thoſe wherein rubble ſtones or bricks, are uſed.

CHAPTER VIII.

Of the ſeveral Sorts of Walls.

THE ſorts of walls are, the reticulated,[1*] (FIG. VIII.) which is now generally uſed; and the antient, which is alſo called the incertain; (FIG. IX.) Of theſe two the reticulated is the handſomeſt, but the joints are ſo ordered, that in all parts, the courſes have an infirm poſition; whereas, in the incertain, the materials reſt firmly one upon the other, and are interwoven together; ſo that they are much ſtronger than the reticulated, though not ſo handſome;[2*] both ſorts are formed of very ſmall pieces, that the walls being ſaturated with mortar, may endure the longer; for the ſtones being of a porous and ſpongy nature, abſorb the moiſture from the mortar; and when there is an abundance of mortar, the wall having more humidity, will not ſo ſoon decay, but will on that account be rendered more durable; for, as ſoon as the humidity is extracted from the mortar by the ſuction of the ſtones, then the lime and ſand ſeparating, the cement is diſſolved, and the mortar no longer uniting the materials, the walls ſoon become ruinous. This may be obſerved in ſome tombs near the city, which are built with marble, or hewn ſtone, and the internal parts rammed with rubble ſtones; the mortar being by length of time drained of its humidity by the ſuction of the ſtones, and the union of the joints being diſſolved, they ſeparate, and fall to ruin.

Fig. IX. To avoid this error, the middle ſpace muſt be ſtrengthened with abutments of the red hewn ſtone, or bricks, or common flints, built in walls two feet thick, and bound to the fronts with cramps of iron fixed with lead; for the work being thus built in a

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(1*) In ſeveral parts of Italy there are walls of the reticulated kind yet ſtanding, that were built in the time of the firſt Roman emperors; which is a ſufficient proof of their ſtrength and durability.

(2*) In the incertain ſort of walls, I underſtand that the courſes were always level, but that the upright joints were not ranged regularly, or perpendicular to each other in the alternate courſes, nor in any other reſpect correſpondently; but were diſpoſed uncertainly, according as the accidental ſize, &c. of the ſtone, or brick, occaſioned. Thus our bricks are commonly arranged in ordinary walls, in which all that is regarded, is, that the upright joints in two adjoining courſes do not coincide. Perault believing that the word *incertum*, ſhould be read *inſertum*, thinks, that the ſtones were arranged in level courſes, and correſponding upright joints, and that this ſort was called *inſertum*, only from the ſtones being inſerted between each other. But I cannot be of this opinion, becauſe in that caſe, this ſort would be as handſome as the reticulated ſort, or more ſo; being the ſame manner in which Vitruvius, at the third chapter foregoing, ſays, the Roman and Greek bricks were diſpoſed, and which he commends as being agreeable.

Nor can I think with Galiani, and ſome others, that in the incertain ſort, the ſtones themſelves were irregular, and were alſo placed diſorderly, without any regard to horizontal courſes, or perpendicular joints; becauſe that arrangement would be leſs firm than the reticulated kind, which is directly contrary to the words of Vitruvius.

The manner I have conjectured is, at leaſt, ſo far right, that it agrees with the words of the text, in being more firm, though leſs handſome than the reticulated, and alſo makes the word *imbricatus* agree with the ſenſe of the paſſage, without reading it *implicatus*, as ſome have ſuppoſed it ſhould be read; for it implies, that in the incertain manner the ſtones are laid in the ſame order as tyles are uſually arranged, which is exactly the fact, according to my ſuppoſition.

regular manner, and not laid in promiſcuous heaps, will remain without defect; and being by the orderly arrangement of the courſes and joints firmly united and bound together, it will not be liable to fractures; nor will the abutments ſuffer it to fall to decay. For this reaſon, the walls of the Greeks are not to be deſpiſed; for though they do not uſe ſmooth, or poliſhed materials, yet where they diſcontinue (3*) the ſquare ſtones, they lay the flints or common hard ſtones that they uſe; in the ſame manner as bricks are generally laid, binding the courſes together with alternate joints; and thus make their works ſtrong and durable.

THESE walls they build in two manners; one is called *Iſodomum*, (FIG. X.) the other *Pſeudiſodomum*, (FIG. XI.) *Iſodomum* is, when all the courſes are of an equal thickneſs; and *Pſeudiſodomum*, when they are unequal: both theſe ſorts are firm; firſt, becauſe the ſtones themſelves are of a compact and ſolid nature, and do not abſorb the moiſture from the mortar, but preſerve its humidity to a great age; and, ſecondly, being ſituated in regular and level courſes, the mortar is prevented from falling; and the whole thickneſs of the wall being united, it endures perpetually.

Fig. XII. ANOTHER ſort is that which they call *Empleƈton*, which is alſo uſed by our villagers. The faces of the ſtones in this kind, are ſmooth; the reſt is left as it grows in the quarry, being ſecured with alternate joints and mortar; but our artificers quickly raiſing a ſhell, which ſerves for the faces of the wall, fill the middle with rubble and mortar; the walls, therefore, conſiſt of three coats, two being the faces, and one the rubble core in the middle. But the Greeks do not build in that manner; they not only build the facing courſes regularly, but alſo uſe alternate joints thorough the whole thickneſs, not ramming the middle with rubble, but building it the ſame as the face, and of one united coat conſtruct the wall; beſide this, they diſpoſe ſingle pieces (A) which they call *Diatonos*, in the thickneſs of the wall, extending from one face to the other, which bind and exceedingly ſtrengthen the walls. Thoſe, therefore, who would build works of long duration, muſt attend to theſe rules, and make uſe of ſuch methods of building; for the ſmooth poliſh, and beautiful appearance of the ſtones, will not prevent the wall from being ruined by age (4*). For this reaſon, when valuations are made of

Fig. XIII.

(3*) Galiani tranſlates this paſſage thus: *nelle fabriche che non richiedono pietre quadrate, adoprano Selce:* in buildings which do not require ſquared ſtones, the Greeks uſe flints, &c. I underſtand it differently; viz. that, in the middle part of the walls, where the ſquare facing ſtones were diſcontinued, the Greeks uſed flints, &c. For it is plain that, Vitruvius here compares the Greek walls with the Roman, only in that ſingle circumſtance of which he is treating; viz. the manner of working the middle part of the wall; ſaying, that though the Greeks did not uſe ſmooth facing ſtones, yet, the internal part of their walls, where the ſquare ſtones were omitted, and flints, &c. were uſed, they built in a better manner than the Romans did, not laying them in promiſcuous heaps, but interweaving them together in the manner of bricks. See Fig. X. and XI. The words of the text are, *ſed cum diſceſſerunt a quadrato, ponunt de ſilice, ſeu de lapide duro ordinarium & ita uti lateritia ſtruentes alligant eorum alternis coriis coagmenta.*

(4*) The Roman *Empleƈton*, Fig. XII. had a core of rubble ſtones in the middle, thrown in promiſcuouſly; but the Greek *Empleƈton*, Fig. XIII. was wrought throughout the whole thickneſs with ſtones, in the ſame manner as the facings, or fronts. The Roman *Empleƈton* differed alſo from the Greek *Iſodomum*, and *Pſeudiſodomum*; in that theſe latter, though they had a core of rubble ſtones in the middle, yet, thoſe rubble ſtones were interwoven together in the manner of bricks, and not laid promiſcuouſly, as in the Roman walls. The Roman reticulated kind, I conclude, was the ſame throughout the whole thickneſs, as Vitruvius ſays nothing to the contrary, and ſpeaks of no core in the middle.

common buildings,[5*] the value is not fixed at the price for which they might be built; but finding from the records, their time of letting, an eightieth part of their original value is deducted for every year elapſed, and the remaining ſum is adjudged to be the value of the building; it being the received opinion, that they cannot endure more than eighty years.

But as to buildings of brick, provided they ſtand perpendicularly, nothing is deducted; they are always eſtimated at the ſum for which they might have been firſt built; in many cities, therefore, the public, as well as private buildings, and even palaces, are conſtructed with bricks; as, the walls of Athens, which look toward the mounts Hymettus and Pentelenſis: the walls of the cells of the temples of Jupiter and of Hercules, are alſo built of bricks, the ſurrounding columns and epiſtylium being of ſtone; the ancient walls of Arezzo, in Italy, excellently wrought: the houſe built by the Attalic kings, at Tralles, which is always given for the habitation of thoſe who bear the office of prieſts of the city: the paintings which were brought from Lacedæmon, were cut from walls of bricks, and conveyed in caſes of wood, to ornament the Comitium, in the edileſhip of Varro and Murena: the houſe of Crœſus, which the citizens of Sardis converted into a college for the retirement of the aged: the mauſoleum of the moſt potent king of Hallicarnaſſus, in which, though the ornaments were all of Proconneſian marble, the walls were built of bricks, which remain to this time exceedingly ſubſtantial; and the incruſtation appears as poliſhed and ſhining as glaſs. Nor was it to avoid expence that this king uſed bricks; for, as he commanded all Caria, his revenue was immenſe, and ſuperfluous; but it was the reſult of his judgement and knowledge in building, as may from the following inſtance be concluded.

He was born at Mylaſſo, but obſerving Hallicarnaſſus to be a place fortified by nature, well adapted for commerce, and having a commodious harbour, he there eſtabliſhed his reſidence. This place is in the form of a theatre; the forum is ſituated at the bottom, near the port. At the top, in the middle of the curve, is formed an area, or ſquare, of ample dimenſions, in the midſt of which ſtands the mauſoleum, a building ſo excellent, that it is numbered amongſt the ſeven wonders of the world. In the middle of the citadel above, is the temple of Mars, having the coloſſal ſtatue which they call Acrolithon, made by the hand of the noble Telochares,[6*] or, as ſome think, by Timotheus. The temple of Venus and Mercury is at the extremity of the right horn of the curve, near the fountain of Salmacis; of which, thoſe who drink, according to a vulgar notion, become amorous: but the origin of this falſe report, which has ſpread over the whole world, muſt be related. It owed its riſe to no property in the water producing effeminacy or unchaſtity; but to its tranſparency and

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(5*) *Paries* may ſignify any ſtructure; either a houſe, or a ſingle wall; I have ſuppoſed it to ſignify the former, in this place; becauſe it appears to me undoubtedly to be the meaning of Vitruvius; the rather, as he preſently after mentions the time of letting, which cannot be ſuppoſed to allude to a ſingle wall, but muſt refer to ſome kind of habitation, or dwelling.

This is one reaſon why I cannot follow the example of Galiani, in tranſlating the word *communis* exterior. See Note 7, Chap. I. Book I.

(6*) Vitruvius names one Leochares, in the preface of his ſeventh Book; and Pliny, Chap. V. Book XXXVI. mentions Leochares, a ſculptor, who flouriſhed under the reign of king Mauſolus; from whence it is thought, that Telochares, here named, was the ſame perſon; the different ſpelling being very likely owing to the miſtake of the copyiſts.

agreeable taſte; for, when Mélas, and Arivanias, conducted to this place a colony from Argos and Trœzen, they expelled the ſavage Carians and Leleges; who flying to the mountains, there aſſembled together, making excurſions, and continually plundering and waſting the country. Some time after, one of the colony, invited by the goodneſs of the water, ſettled a tavern near this fountain, for the purpoſe of gain, furniſhing it with all neceſſaries; this inticed thither the barbarians, who reſorting thither ſingly, and frequently meeting there in numbers, by degrees changed their rude and ferocious manners, for the cuſtoms and urbanity of the Greeks; and were thus voluntarily ſubjected. Hence the report aroſe; not from any effect of the water, but from its being the means of civilizing the minds of the barbarians. I now quit this ſubject, to return to the deſcription of the city, in which I was engaged.

As the temple of Venus, and the above mentioned fountain, ſtands on the right horn, ſo on the left, ſtands the royal palace, which king Mauſolus there judiciouſly ſituated. For on its right ſide, it commands the view of the forum, the port, and the whole compaſs of the city; on its left there is a ſecret port, ſo concealed by the mountains, that none can ſee or know what is there tranſacted; and the king himſelf could, from his palace, privately give his commands to his ſeamen and ſoldiers. After the death of Mauſolus, when his wife Arthemiſia reigned, the Rhodians, filled with indignation that all the cities of Caria ſhould be governed by a woman, diſpatched a powerful fleet to take poſſeſſion of the kingdom; Arthemiſia, hearing this, prepared a private ſquadron, well furniſhed with mariners and ſoldiers, and concealed them in this ſecret port; ordering the reſt of the citizens to guard the walls. When the pompous fleet of the Rhodians appeared before the greater port, ſhe commanded thoſe who guarded the walls, to ſeem to give them encouragement, and pretend that they would ſurrender the town; the deluded Rhodians having entered within the walls, and left their navy weakly defended, Arthemiſia, unexpectedly opened a canal that had a communication with the ſea, brought the ſquadron out of the ſecret port into the greater, and the Rhodian fleet being abandoned by the mariners and ſoldiers, and left defenceleſs, ſhe drew it off to ſea. The Rhodians, therefore, having no place of retreat, and being ſurrounded on all ſides, were ſlain in the aforementioned forum. Arthemiſia then embarked her rowers and mariners in the Rhodian veſſels, and ordered them to ſail to Rhodes: the Rhodians ſeeing their veſſels approach, decorated with laurel, believed their fellow citizens were returned victorious, and received the enemy. By this ſtratagem, Arthemiſia ſurpriſed Rhodes; ſlew the principal men, and then raiſed a trophy of her victory in the midſt of the city; making two ſtatues of braſs, one repreſenting herſelf, and the other, the city of Rhodes, held by her in ſubjection. In after times, the Rhodians (as their religion forbad the removal of a conſecrated monument) erected a high wall around it, in the Greek manner, that the trophy might not be ſeen, and ordered it to be called *Abaton*.

As, therefore, ſuch great and potent princes did not diſdain to erect walls of bricks, whoſe revenues and ſpoils would have enabled them, to uſe not only rough, or hewn ſtones, but even marble; I think, edifices conſtructed of bricks, are not to be diſapproved, provided they are well executed. But bricks cannot be uſed by the Romans within the city; the

reaſon of which, I muſt not omit to explain. The laws permit no walls which are built in public places, to be of a greater thickneſs than one foot and a half; and to ſave room, other walls are made of the ſame thickneſs; but brick walls of a foot and a half thick, unleſs they contain the length of two or three bricks in that thickneſs, cannot ſuſtain more than one ſtory[7*]; yet, the dignity of the city, and the multitude of citizens, requiring innumerable habitations, and, as the area of the city cannot contain ſo great a number as inhabit it; to remedy the deficiency, the height of buildings is encreaſed. To this end, the walls are raiſed with hewn ſtone, teſtaceous ſubſtances[8*], or rubble, and built many ſtories high; thus making convenient apartments, both for repaſt and proſpect; by means, therefore, of galleries, and multiplying the ſtories, the habitations are, without inconvenience, made ſufficient, and ſuitable for the Roman people. Thus the reaſon is given, why, on account of the limited ſpace of the city, it is neceſſary to prohibit walls of brick; whereas, without the city, buildings of brick may be ſo executed, as to endure firm to a great age.

The tops of walls, juſt under the tiles, ſhould be built of teſtaceous materials, for about the height of a foot and a half; and ſhould have a projecting cornice, by which means the uſual defect will be avoided; for, if the tiles of the roof happen to be broke, or blown off by the wind, and the rain water penetrates, this teſtaceous covering will prevent it from injuring the bricks, and the projecting cornice ſhelters, and by that means preſerves, the walls from damage. Whether teſtaceous ſubſtances are defective or not, cannot at firſt be known; but if they remain ſound, after having laid in the roof, and endured a winter and ſummer, they are good; for ſuch as have not been made of good loam, or have not been ſufficiently burnt, on being thus tried by the rain and froſt, diſcover their imperfection. Thoſe, therefore, that will not anſwer their purpoſe in the roof, cannot be firm enough to bear the weight of the walls; wherefore, walls built of old tiles, from a roof, will be the moſt ſubſtantial.

As to the hurdle walls, I wiſh they had never been thought on; for, however convenient they may be, on account of expedition, or for ſaving ground, they are, nevertheleſs, a great

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(7*) To underſtand this paſſage, it is neceſſary to be here recollected, that the Roman bricks, called *Didoron*, were a foot and a half long, and a foot broad; conſequently, if they had uſed theſe bricks in walls of a foot and a half thick, ſuch walls being but one brick in thickneſs, muſt have been very weak; becauſe the bricks could not have been interwoven and united together, or, as our workmen expreſs it, they could have had no bond. Unleſs, therefore, (as Vitruvius intimates) their bricks had been made of ſuch a ſize, that the length of two or three of them might have been contained in the thickneſs of the wall, the work could not have been ſufficiently ſtrong to have bore many ſtories.

Our laws have alſo limited the thickneſs of party walls to 2 foot and 2 half; not indeed with a ſimilar intention, to prevent our making them too thick, which is not our propenſity; but on the contrary, to prevent our making them too thin. Yet, we find our walls of a foot and a half thick, ſtrong enough to bear ſeveral ſtories; the reaſon of which is, that our bricks are ſo ſmall, that the length of two of them may be contained in the thickneſs of the wall, and, therefore, they may be properly interwoven and bonded together.

(8*) It appears evident, that by teſtaceous ſubſtances, Vitruvius means tiles, or ſome ſort of burnt earth, and not any kind of ſhells, as ſome have imagined; for, a little after, he ſays, it cannot at firſt be known whether they have been made of proper loam, or have been well burnt; and alſo ſpeaks of walls built of tiles.

The whole of this chapter is very ſimilar to the 14th chapter of the 35th book of Pliny, and it is very probable that one was copied from the other. See the Obſervations on the Life of Vitruvius.

and public evil; being as liable to take fire as faggots, purpoſely prepared; it is better to be at the coſt of brick walls, than to ſave that expence by living in danger. In thoſe which are plaiſtered, crevices are left perpendicularly and tranſverſely; for, upon receiving the plaiſter, its humidity cauſes them to ſwell, and, as it dries, they contract; by which they break and deſtroy the texture of the incruſtation; but, as ſome perſons, on account of diſpatch, or poverty, or to ſave ground, may be obliged to uſe them, they ſhould build them in this manner. A footing ſhould be built ſo high that the hurdles may be raiſed from the gravel and pavement; for, if they are ſunk in the ground, they ſoon become rotten, and by ſettling downward, break the face of the plaiſtering.

HAVING treated of walls in general, and the preparation and properties of the materials of which they are conſtructed, in the beſt manner I have been able, I ſhall now ſpeak of the floors, the materials of which they are formed, and the manner of preparing them, ſo that they may endure unimpaired a great length of time.

CHAPTER IX.

Of Timber.

TIMBER may be felled, from the beginning of autumn, to the time when the wind Favonius begins to blow (1*); for, in the ſpring, all trees become pregnant, and put forth their annual fruit in the branches, according to their ſeveral natures; when, therefore, by the influence of the ſeaſon, they are porous and humid, they are then rendered weak and uſeleſs. The bodies of women, when they have conceived, are not judged to be in health till after their delivery; neither are ſlaves, when pregnant, deemed ſound; becauſe in bodies that are breeding, the fœtus draws all the nouriſhment of the food to itſelf; and, as it encreaſes, and approaches nearer to the time of delivery, the leſs ſound the generating body becomes; but when the fœtus is delivered, the nutriment which it before attracted to itſelf, is received by the exhauſted and open veſſels of the progenetrix, which abſorbing the juices, the body is reſtored to its former natural ſanity. For the ſame reaſon, at the ſeaſon of autumn, when the fruits are ripe, and the branches grow flaccid, the roots receiving in themſelves the juices of the earth, the trees are recovered and reſtored again to their former vigour; for they are compreſſed and conſolidated by the force of the winter air: if, therefore, the timber is felled according to theſe rules, and at the time above written, it will be found the moſt proper ſeaſon.

(1*) The wind Favonius was ſuppoſed to begin to blow about the eighth day of February. Pliny, book 16, chap. 25.

Trees are to be felled in this manner: they ſhould be cut half through their thickneſs to the pith, and ſo left, that by diſcharging the ſap they may grow dry; for the emiſſion of the uſeleſs juices from the pith, will prevent the timber from being corrupted by the retention of the putrid matter. Then when the tree is thoroughly dry, and drops no longer, it muſt be felled; and being thus prepared, it will be fit for uſe. It may be obſerved that ſhrubs, at the proper time, become perforated at bottom; and by means of thoſe perforations, pour out from the pith their ſuperfluous and vitiated juices, and thus drying, render themſelves durable. In thoſe which have not this efflux, the ſtagnating humours putrefy, and render them unſound and periſhable. If, therefore, trees are found to be preſerved by drying while they are ſtanding and vegetating, without doubt they ſhould be ſo treated when they are to be felled for timber; for being prepared in that manner, they will remain in the building ſerviceable to a great age.

Trees are of various kinds, and have different properties; as, the oak, the elm, the poplar, the cypreſs, the fir, &c. which are the kinds chiefly uſed in building. The oak has not the qualities of the fir, nor the cypreſs of the elm; nor are any of the others alike in their qualities; but each kind has a peculiar nature and mixture of the elements, and one or other will anſwer all purpoſes. In the firſt place, the fir has much air and fire, and little water and earth; being therefore conſtituted of things of a light nature, the wood is not ponderous, is naturally rigid, and will not eaſily bend under its burthen, but will remain in the flooring, ſtraight, and inflexible: this wood, however, having much heat, is apt to breed worms, which deſtroy itſelf. It alſo eaſily takes fire; for being light, open, and aireal, it readily kindles, and emits a violent flame; that part of it which is neareſt the earth before it is felled, receiving moſt moiſture on account of its proximity to the root, is rendered knotleſs, and moſt humid: on the contrary, the upper part, which, by reaſon of the fervent heat, is extended in the air in knotty branches, being cut at the height of twenty feet, and hewn ſmooth, is, from its knotty hardneſs, called *Fuſterna*; but the bottom part, when it is hewn and ſeparated into four quarters, the ſappy part being rejected, is reſerved for the internal work, and called *Sapinus*.[2*]

The oak, having a ſuperabundance of the element of earth, and very little water, air, and fire, when uſed in works in the ground, will endure for ever; for being impervious and cloſe, it, on account of its compactneſs, will admit no moiſture into its ſubſtance; but reſiſting and ſhunning the humidity, warps, and ſplits the work in which it is uſed. The *Eſculus*,[3*] which is equally compounded of all the elements, is of great uſe in building; but if placed in water, the humidity entering its pores, and expelling the air and fire, makes it ſoon decay.

(2*) See Note 13. Chap. II. Book I.

(3*) I have mentioned this tree by its Latin name; for it is doubtful, what tree is to be underſtood by it; ſome ſuppoſing it to be a beach, and ſome a ſpecies of oak, called the holm; but this latter is more generally ſuppoſed to be the Cerrus, which Vitruvius names afterward.

Pliny, in his Natural Hiſtory, book 16. chap. 5. ſeems to ſpeak of the *Eſculus* as well as the *Cerrus*, as different ſpecies of oaks.

THE holm, the cork, and the beech, have an equal mixture of water, fire, and earth, but abound in air; being therefore porous, and eaſily permitting fluids to penetrate them, they ſoon periſh.

THE white and black poplar, the willow, the lime, and the agnus caſtus, are replete with fire and air, have a moderate portion of water, and very little earth; they are therefore of a light temperature, and have a toughneſs which is found exceeding ſerviceable; for not being hardened by a large mixture of earth, and by reaſon of their rarity, being white, they are very manageable, and proper for carving.

THE alder, which grows near the banks of rivers, and is a wood not much uſed, has ſome excellent qualities; for being compounded of much air and fire, and a little portion of earth and water, its ſubſtance is not overcharged with moiſture. Piles, therefore, of this wood, being drove in the foundation of edifices which are erected in marſhy places, there imbibing the humid element of which their ſubſtance leaſt partakes, will endure eternally, and ſupport the moſt ponderous ſtructures. This wood, therefore, which out of the earth can endure but a ſhort time, will, if buried in a watery ſoil, laſt for ever. This may be chiefly obſerved at Ravenna, for there all buildings, as well public as private, have theſe kind of piles in their foundations.

THE elm, and the aſh, having much water, little air and fire, and a moderate quantity of earth, are, by reaſon of their abundant humidity, too pliable, and eaſily bend under their burden; but when they become dry by age, or have arrived at that ſtate of perfection in growing, the moiſture within them being inactive and ſtagnant, they then become more tough, and from their flexible quality are very uſeful and ſtrong in all caſes where joinings are neceſſary.

THE maple likewiſe containing much air and water, and little fire and earth, is not brittle, but has a uſeful pliability. The Greeks, therefore, who make the yokes of oxen, called *zyga*, of this wood, name it *Zygian*.

NOR leſs to be valued are the cypreſs and pine, which have an abundance of water, and an equal mixture of the other elements; being therefore replete with moiſture, if they are uſed when green, they are apt to ſplit; but when old they remain long without defect; for the juice which is in their ſubſtance, has a bitter ſavour, and by its acrimony, ſuffers no worms, or any deſtructive vermin, to enter; for which reaſon, buildings conſtructed of theſe kinds of timber, endure an immenſe time.

THE cedar and juniper have the ſame virtues and uſes; and, as from the cypreſs and pine comes reſin, ſo from the cedar flows the oil which is called *Cedrium*; with which books, and other things, being anointed, are preſerved from moths and worms; the leafage of theſe trees is like that of the cypreſs; and the fibres are ſtraight. The ſtatue in the temple of Diana, at Epheſus, is made of this wood; ſo alſo, on account of its durability, are the

Lacunariæ[*] of that, and of many other magnificent temples. Theſe trees grow chiefly in Crete, Africa, and in ſome parts of Syria.

THE larch tree, which is unknown, except to the inhabitants about the banks of the Po, and the ſhore of the Adriatic ſea, is not only preſerved from the rot, and worms, by an exceſſive bitter juice, but is alſo ſecure from fire; for it will not flame, but will only conſume to a calx, as ſtones do in the furnace, by the means of other wood; nor will it even then burn, and become as a coal, but ſlowly, and after a long time will be conſumed. The reaſon is, becauſe it has in its ſubſtance very little of the elements of fire and air; but of water and earth, it is replete and full; and has no pores by which the fire may enter to diſſolve its texture. This wood will not ſoon decay, and, on account of its ponderoſity, water cannot ſuſtain it; ſo that when it is to be tranſported, it is placed either in veſſels, or on rafts of fir. The firſt diſcovery of this timber happened thus: when the army of the deified Cæſar was near the Alps, he commanded the inhabitants to ſhew him a ſafe paſſage, and to conduct him over thoſe mountains; there was a fortified caſtle called Larignum, and thoſe that were therein confiding in its natural ſtrength, refuſed to obey his command: the emperor, therefore, ordered it to be attacked. Before the gate of the caſtle was a tower, conſtructed like a funeral pile, with beams of this wood placed alternately tranſverſe, from the top of which they annoyed the aſſailants with ſtakes and ſtones; when it was obſerved that they had no other weapons than wooden darts, and that they could not throw them far from the walls, by reaſon of their weight, orders were given to approach with faggots and burning faſcines, and pile them againſt the tower. The ſoldiers quickly obeyed, and the flames from the faggots aſcending to a great height round the tower, made it believed that the whole maſs was conſumed; but when the fire abated, and was extinguiſhed, the tower appeared unhurt. Cæſar, ſtruck with admiration, then ordered it to be aſſaulted with the miſſile engines; upon which, the country people being affrighted, ſurrendered. It was then demanded of them, where this timber, which remained unhurt by fire, grew; and they ſhewed theſe trees, of which in that place there is a great abundance; from the caſtle of Larignum, therefore, this tree takes its name. This timber is brought by the river Po to Ravenna, to ſupply the colonies of Fano, Peſaro, Ancona, and the other municipal cities in that diſtrict: if it could conveniently be brought to Rome, it would be of great utility in building; for, in caſe it could not be uſed in all parts, at leaſt it might be diſpoſed in the projectures about the eaves of the inſular buildings, and thereby greatly contribute to ſecure them from the danger of fire; for this wood will neither flame, nor will it burn like a coal. The leaves of this tree are like thoſe of the pine; the timber is large; and for inſide work, not leſs manageable than the Sappinus; it yields a liquid reſin of the colour of Athenian honey, by which the phthiſic is cured.

THUS I have explained the ſeveral kinds of timber, and their properties; I ſhall next give the reaſon why that kind of fir, which at Rome is called Supernas, is worſe than

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([*]) The *Lacunaria* are the pannels or coffers in the cielings, or in the ſoffites of the cornices, &c.

that called Infernas, which is exceeding durable, and ſhall explain the good and bad qualities they derive from the nature of the places where they grow, that they may be fully underſtood.

CHAPTER X.

Of the Firs called Supernas, and Infernas.

THE Appenine mountains riſing from the Tyrrhene ſea, have their origin in the Alps, and in the extreme parts of Hetruria.[1*] Theſe mountains bend like a yoke, the middle of the curve almoſt touching the ſhore of the Adriatic ſea, from whence they take their courſe toward the Straights. The nether ſide of theſe mountains, which looks toward the country of Hetruria, and the Campania, is of a warm nature; the ſun inceſſantly ſhining on it the whole day; but the farther ſide, which declines toward the Adriatic ſea, being turned to the northern regions, remains continually obſcure, and in ſhadow. The trees, therefore, which grow on that ſide, being nouriſhed by a humid ſoil, not only encreaſe to a great magnitude, but, from the abundance of moiſture, have their pores ſaturated therewith; and when felled and hewn ſmooth, loſing their vegetative property, and the toughneſs of their fibres altering as they dry, they, by reaſon of their poroſity, become weak and periſhing, ſo that they will not endure long; but thoſe which grow in places expoſed to the heat of the ſun, being leſs porous, and their juices being extracted, are rendered more durable; for the ſun not only abſorbs the moiſture from the earth, but exhales it from the trees alſo; thoſe, therefore, which grow in the ſunny parts, having their fibres cloſe and compact, and not being rendered porous by too much humidity, will, when hewn into timber, remain long

(1*) Now called Tuſcany, or rather the preſent Tuſcany is part of Hetruria.

This paſſage has been differently rendered by the tranſlators. They have been induced to think that the text erroneouſly deſcribes the extent of the Appenines, to be from the Alps to that extreme of Tuſcany next Rome, thereby implying that they extended no farther; whereas, it is well known that they extend from the Alps to the extremity of Italy, far beyond the confines of Tuſcany, or limits of ancient Hetruria.

The text ſays, the Appenines have their origin in the Alps, and in the extreme parts of Hetruria; meaning (as I underſtand it) that extremity of Hetruria which is toward the Alps, not the other extremity toward Rome; Vitruvius, in that place, ſpeaking only of their riſe, not of their extent. In the next paſſage he ſpeaks of their extent, ſaying, they advance toward the Adriatic ſea, and from thence bend their courſe toward the Straights; meaning, without doubt, the Straights of Meſſina, at the extremity of Italy, to which they really do extend, and where they terminate. So that the deſcription, according to the text, is perfectly juſt. The words of the text are: *montis Appennini primæ radices ab Tyrrheno mari in Alpes & in extremas Hetruriæ regiones oriuntur, ejus verum montis jugum ſe circumagens media curvatura prope tangens oras maris Adriatici pertingit circuitionibus contra Fretum.* By the words, *in extremas Hetruriæ*, has been generally underſtood, that extremity of Hetruria next Rome; which has been the ſource of the miſtake. This is an unimportant matter; but as it has been generally miſapprehended, and ſuppoſed to be an erroneous deſcription, I thought proper to mention it. See Perault's Note on this Paſſage.

ſerviceable. This is the reaſon, therefore, that the fir called Infernas, which is brought from the ſunny ſide, is preferable to that called Supernas, which comes from the ſhady ſide.

Thus much have I treated, as well as I have been able, of the materials neceſſary for the conſtruction of buildings; of the elements of which they are obſerved to be conſtituted, and alſo of the ſeveral properties they poſſeſs, that they may not be unknown to thoſe who build. Thoſe, therefore, who follow theſe precepts, will, by properly adapting the ſeveral kinds of materials to their uſes, be deemed the moſt ſkilful. The preparatives being now fully explained, I ſhall, in the following books, treat of buildings; and, firſtly, as due order requires, of the ſymmetry and proportion of the ſacred temples of the immortal Gods.

THE END OF THE SECOND BOOK.

THE ARCHITECTURE OF M. VITRUVIUS POLLIO.

BOOK THE THIRD.

PROEM.

APOLLO of Delphos, by the voice of the prieſteſs, pronounced Socrates to be the wiſeſt of men. This wiſe and judicious man is reported to have ſaid, that the human breaſt ſhould have been open as a window, that the thoughts might not have been concealed, but have been expoſed to obſervation; ſo, following his idea, I wiſh that all nature had been conſtituted open and apparent; that not only the virtues and vices of mankind might have been readily diſcerned, but alſo, that the knowledge of all ſciences might have been evident to the ſenſes; that no erroneous opinions might have prevailed, and all arts and erudition have been truly and perfectly comprehended. But as things are not thus conſtituted, and it is not poſſible to diſcover the capacity and knowledge which lays concealed in the minds of men; it therefore often happens that artiſts of great abilities, who are not rich, or have not become known by long buſineſs, or by recommendation, and are alſo unſkilled in popular eloquence, cannot obtain by their works, the reputation of poſſeſſing ſo much merit, as thoſe who are eminent are believed to poſſeſs.

THIS we may chiefly obſerve among the ancient ſtatuaries and painters, who have gained commendation, and whoſe names will remain famous to the lateſt poſterity; as Myron, Polycletus, Phydias, Lycippus, and others who have acquired reputation by their art; for they have obtained it by executing works for great cities, kings, or noble perſons; while others, who have not been leſs ingenious and capable, and have performed excellent works for private and unknown perſons, have obtained no fame; not for want of induſtry, or capacity, but of good fortune: ſuch are Hellas, of Athens; Chion, of Corinth; Myagrus, of Phocis; Pharax, of Epheſus; Bedas, of Byzantium; and many others. Alſo among the painters, Ariſtomenes, of Thaſos; Polycles, of Atramitene; Nicomachus, and others,

who were neither deficient in induſtry, the knowledge of their art, or ingenuity; but either poverty, ill fortune, or being overcome in their purſuits by opponents, have impeded their ſucceſs. Nor is it wonderful that, on account of people's ignorance of the arts, the meritorious ſhould be neglected; but it raiſes our indignation when the intereſt of friends influences the judgment to a falſe preference. Wherefore, as Socrates ſaid, if all thoughts, opinions, and knowledge, became viſible and evident, neither favour nor intereſt would avail; but whoſoever by real application and ſtudy became moſt capable, would be voluntarily employed. However, as things are not thus open and apparent, and I obſerve that the ignorant receive encouragement more frequently than the ſkilful, I judge it not proper to contend with the illiterate; but rather, by publiſhing theſe precepts, to manifeſt the uſefulneſs of our art.*

In the firſt book, therefore, O emperor, I have written of the art, its uſes, and of the ſciences an architect ought to underſtand; adding the reaſons why he ſhould be ſo qualified; I have alſo regulated the parts, and determined the limits of architecture: then, becauſe it was moſt neceſſary, and firſt to be done, I have treated of the rules for chuſing healthy ſituations; the manner of building the fortifications; of the ſeveral winds, and from what regions they blow; explaining the ſame by draughts; and alſo, of the commodious diſtribution of the ſtreets and lanes within the walls; of all which the firſt book conſiſts. In the ſecond, I have written of the materials, their uſes in buildings, and the properties they naturally poſſeſs. Now, in the third, I ſhall ſpeak of the ſacred temples of the immortal Gods, and of the manner in which they ought to be conſtructed.

(*) Vitruvius's deſcription of his own time ſeems very juſtly to agree with the preſent. It is now uſual for ignorance and intereſt to prevail over merit; it indeed ſeems to be the natural effect of things; for merit is naturally diffident and reſerved, as ignorance (having nothing elſe to depend on) is neceſſarily aſſuming, and forward; and the latter qualities muſt generally prevail; becauſe the majority of people cannot have ſo much knowledge in every art as is requiſite to enable them to diſtinguiſh merit from incapacity; for which reaſon they are obliged to form their opinion, on the pretences, appearances, or public fame of perſons, or elſe are governed in their choice by intereſt and prejudice. If merit is preferred for its own ſake, it is as much owing to the knowledge of the judges, as to the ſkill of the artiſt; for how ſhould merit be preferred, unleſs it is perceived; and how ſhould it be perceived, unleſs the judges have a ſufficient knowledge of the art, to enable them to diſtinguiſh it?

CHAP.

CHAPTER I.

Of the Compoſition and Symmetry of Temples.

THE compoſition of temples, is governed by the laws of ſymmetry; which an architect ought well to underſtand; this ariſes from proportion, which is called by the Greeks, *Analogia.* Proportion is the correſpondence of the meaſures of all the parts of a work, and of the whole configuration, from which correſpondence, ſymmetry is produced; for a building cannot be well compoſed without the rules of ſymmetry and proportion; nor unleſs the members, as in a well formed human body, have a perfect agreement.[1*] For nature has ſo compoſed the human body, that the face from the chin to the roots of the hair at the top of the forehead, is the tenth part of the whole height; and the hand, from the joint to the extremity of the middle finger, is the ſame; the head, from the chin to the crown, is an eighth part; and it is the ſame from the bottom of the neck. From the ſummit of the breaſts, to the roots of the hairs, is a ſixth[2*]; and to the top of the head it is a fourth; ſo alſo from the bottom of the chin to the bottom of the noſtrils, is a third part of the height of the face; the noſe, from the bottom of the noſtrils, to the middle of the eye-brows, is the ſame; and from thence, to the roots of the hairs where the forehead ends, it is alſo a third part. The foot is a ſixth part of the height of the body; the arm[3*] is a fourth; the cheſt[4*] is likewiſe a fourth; the reſt of the members have their meaſures alſo proportional; this the ancient painters and ſtatuaries ſtrictly obſerved, and thereby gained univerſal applauſe. In like manner, the meaſures of the ſeveral parts of ſacred edifices ſhould have due correſpondence to the magnitude of the whole. The central point of the body is the navel: for if a man was laid ſupine with his arms and legs extended, and a circle was drawn round him, the central foot of the compaſſes being placed over his navel, the extremities of his fingers and toes would touch the circumferent line; and in the ſame manner as the body is adapted to

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(1*) Vitruvius has alſo defined ſymmetry and proportion in the ſecond chapter of the firſt book; but his definitions here, as well as there, ſeem equally confuſed and unintelligible.

(2*) This cannot mean to the root of the hairs above the forehead; for, if it is a fourth from the breaſt to the top of the head, it muſt be above a ſixth from the breaſt to the top of the forehead. If it may be underſtood to the roots of the hair at the lower part of the face adjoining the ears, or at the neck, it will exactly agree; the diſtance of thoſe parts, from the breaſts, being exactly a ſixth part of the whole height of the body.

(3*) This means the cubitus, or arm, from the elbow to the end of the fingers.

(4*) The text has it *pectus*, which I have tranſlated cheſt, rather than breaſt; believing Vitruvius ſignifies by that word, the trunk of the body, from the breaſt to the lower part of the belly; and which is a fourth part of the height of the body. For ſhould I ſuppoſe that Vitruvius meant the breadth acroſs the breaſt, as Galiani and others have done, it would be irreconcileable with the true proportion of the body: I am the rather inclined to be of this opinion, as Vitruvius has already deſcribed the upper part of the body above the breaſt; and, therefore may very naturally be ſuppoſed to ſpeak now of the part below it.

the circle, it will alſo be found to agree with the ſquare; for, if the meaſure from the bottom of the feet to the top of the head is taken, and applied to the arms extended, it will be found that the breadth is equal to the height, the ſame as in the area of a ſquare.

SINCE, therefore, nature has ſo compoſed the human body, that the members are proportionate and conſentaneous to the whole figure, with reaſon the ancients have determined, that in all perfect works, the ſeveral members muſt be exactly proportional to the whole object; and, as in all works they preſcribe this method, ſo more eſpecially in the temples of the Gods, in which the excellencies and faults remain for ever. The meaſures, which are neceſſarily uſed in all works, are alſo derived from the members of the human body; as, the digit,[5*] the palm, the foot, and the cubit; theſe are divided into the perfect number, which the Greeks call *Telion*; for the ancients believed the perfect number to be that which is called *ten*; becauſe *ten* is the number of the fingers of the hands: from the digit, the palm, and from the palm, the foot was invented.

ALSO as nature has formed ten fingers to the hands, Plato eſteemed that number perfect; decads being produced by unities, which the Greeks call *Monades*. Advancing to eleven, or twelve, the numbers become imperfect, till they arrive at the next decad; for unities are the conſtituents of that number.

THE mathematicians, on the contrary, argue that the perfect number is that called *ſix*; becauſe, according to their principles, it has ſix proportional diviſions. Thus, one is the Sextant ($\frac{1}{6}$); two, is the Trient ($\frac{1}{3}$); three is the Semis ($\frac{1}{2}$); four, the Bes ($\frac{2}{3}$); which is called *Dimoiron*; five, the Quintarius ($\frac{5}{6}$), called *Pentamoiron*; ſix, the number perfect. Then counting upward, and adding one ſixth, it is called *Ephecton*; eight, becauſe it is the addition of a third, is the Tertiarius, which is called *Epititros*; nine, being the addition of the half, is the Seſquialter, called *Emiolios*; ten, is the Beſalter, ealled *Epidimoiron*; the number eleven, being the addition of five, is the Quintarium Alterum, called *Epipentamoiron*; and twelve, becauſe it is formed of twice the ſimple number, is called *Dyplaſiona*.

MOREOVER, the foot of a man is the ſixth part of his height; becauſe, therefore, ſix times the meaſure of the foot terminates the height of the body, they eſtabliſh it as the perfect number; obſerving alſo that the cubit, (or arm,) contains ſix palms, (or hands,) and twenty-four digits, (or fingers.)[6*] As the cubit contains ſix palms, for that reaſon, it ſeems the cities

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(5*) The digit is a finger's breadth, as the palm is a hand's breadth.

(6*) If the beauty, or agreeable effect reſulting from the compoſition, or configuration of a work, principally depends on the proportion and ſymmetry of its parts, (as in my opinion it does,) and if any one number can be ſaid to be better adapted to produce that proportion and ſymmetry than another, it muſt be that whoſe integral parts are beſt ſuited to all the poſſible, or at leaſt, proper proportions that may be uſed in any work. The number ſix has in this reſpect the preference of any other; not from any ſuppoſitions, or imaginary virtue, but for uſeful and poſitive power; for this number being formed by the union of the radix's of the

of Greece divided their drachm into ſix parts; for their drachm contains ſix equal pieces of braſs coin, like the Aſſe, which they call Oboli, and each Obolus containing four Dichalcæ, or, as ſome call them, Trichalcæ, make twenty-four in a drachm; anſwering to the digits in a cubit; but we originally choſe the former number *ten*; and conſtituted the Denarius, *Denos æreos*, of ten braſs Aſſi[7*]; which piece of money to this day retains the name of Denarius. The *Seſtertius* alſo, which is a quarter part of a Denarius, was ſo called, becauſe it contained two whole Aſſi, and half of the third Aſſe. But afterward, conſidering that both the numbers ſix and ten were perfect, we joined them together, and ſo made the moſt perfect number, *ſixteen*; from hence aroſe the diviſions of the foot; for, deducting two palms from the cubit, there remains four; and, as each palm contains four digits, the foot, of courſe contains ſixteen; and juſt ſo many braſs Aſſi are in the Denarius. Thus, all meaſures were derived from the members of the human body; and as the ſeveral members thereof have a proportional relation to the whole, ſo in the temples of the immortal Gods we ſhould endeavour, that the parts of the work may be ſo regulated, that their proportion and ſymmetry, ſeparately, and unitedly, may be comformable and correſpondent.

THE principles of temples, which determine their aſpect and figure, are theſe; firſt, IN ANTIS, which by the Greeks is called *Naos en paraſtaſin*; then PROSTYLOS, AMPHIPROSTYLOS, PERIPTEROS, PSEUDODIPTEROS, DIPTEROS, and HYPÆTROS[8*]; by which principles, the formations of temples are diſtinguiſhed.

Fig. XIV. A temple is, IN ANTIS, when it has Antæ (D), in the front of the walls, which circumclude the cell[9*] (A); in the middle between the Antæ, two

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duple and triple numbers, viz. 2 and 3, (which being multiplied together make ſix). It naturally becomes moſt eaſily reſolvable into every other number, whether duple or triple; and conſequently is moſt capable of agreeing with all proportions of what kind ſoever.

It may alſo be obſerved, that the ratio of all the muſical concords are within the compaſs of a ſixth; and the ratio, ariſing from the multiplication of all their numerators and denominators, is in its loweſt term, as one, to ſix.

Neither can the ſenſes diſtinguiſh with facility a diviſion leſs than a ſixth; the 8th, 10th, and 12th, are eaſy to diſtinguiſh, only by reaſon of their compariſon with the 4th, 5th, and 6th.

Proportion is diſtinguiſhed into arithmetical, geometrical, and harmonical; the firſt is, when a ſeries of numbers in progreſſion, have the ſame real difference; as 2, 4, 6, 8, 10, 12, &c. The ſecond is when they have the ſame proportional differences; as 2, 4, 8, 16, 32, &c. The third is, when in three numbers, the firſt is to the third, as the difference between the firſt and ſecond is to the difference between the ſecond and third; as 6, 4, 3. Or, in four numbers, when the 1ſt is to the 4th, as the difference between the 1ſt and 2d is to the difference between the 3d and 4th; as, 4, 5, 6, 8. This latter kind of proportion, is that which the concords of muſic bear to each other; as for example, 6, (the fundamental) is to 3, (the octave) as the difference between 6 and 4 (the fifth) is to the difference between 4 and 3.

Barbaro, in his notes, has launched out exceſſively in his remarks on the ſeveral kinds and variations of proportions; but I believe the hints I have here given, and the notes at Chap. I. Book I. will be found ſufficient for an architect's attention and uſe.

(7*) The Denarius was originally divided into ten aſſi; but in the 485th year of Rome, an alteration took place, from which time it contained ſixteen aſſi.

(8*) Moſt of theſe names are derived from *Stylos*, column; and *Pteron*, wing. Thus *Proſtylos*, ſignifies having columns in front; *Amphiproſtylos*, columns in both fronts; *Peri-pteros*, winged round, or having columns all round; *Di-pteros*, double winged; and *Pſeudo-dipteros*, falſe double winged; *Hypethros*, ſignifies uncovered; and *In Antis*, having antæ, or pilaſters.

(9*) The cell is the internal part, or chamber of the temple A, Fig. XIV, XVIII, &c.

columns (F); and the Faſtigium[10*] (E), placed above in the proportion which will be deſcribed in this book. An example of this is at the three temples of Fortune,[11*] in that of the three which is next the gate Collina.

Fig. XIV. Prostylos has all things the ſame as *In Antis*; but has alſo two columns (C), oppoſite the two angular Antæ (D), and the Epiſtylium[12*] (I), above, in the ſame manner as *In Antis*; as alſo on the returns to the right and left.[13*] An example of this, is in the temple of Jupiter, and of Faunus,[14*] on the iſland in the Tiber.

Fig. XV. Amphiprostylos, is the ſame as *Proſtylos*; but has alſo columns, and a Faſtigium in the Poſticus (H), in the ſame manner.

Fig. XVIII. Peripteros has, in the front, and in the Poſticus, ſix columns; and in the flanks, eleven, including thoſe at the angles; which columns are ſo diſpoſed, that the diſtance of an intercolumn is left all round between the walls, and the extreme range of columns, forming a walk about the cell of the temple. Thus is the temple of Jupiter Stator, in the Porticus of Metellus,[15*] which was deſigned by Hermodus;[16*] and the Marian[17*] temple of Honour and Virtue, built by Mutius, without a Poſticus.

(10*) *Faſtigium* is the word Vitruvius uſes for the pediment, or angle of the roof. See E, in the Elevations of Fig. XIV, &c.

(11*) This alludes to a place in Rome where there were formerly three temples of Fortune.

(12*) Epiſtylium, in this place ſignifies the whole entablature, I, I, Fig. XIV.

(13*) The manner of empreſſion here uſed, makes it doubtful whether the epiſtylium only, or the columns alſo, returned on the angles. The tranſlators have underſtood it differently; but the latter manner is ſo impure and ſo foreign to the practice of the ancients, that I cannot heſitate in rejecting it.

(14*) Titus Livius, L. 54, S. 53, mentions the temples of Jupiter and of Faunus, as two diſtinct temples. Barbaro alſo deſcribes that of Jupiter to be near the temple of Eſculapius; and that of Faunus, at another part of the iſland; of this latter he ſays, "a few ruins were to be ſeen in his "time, but which would ſoon be deſtroyed, as the Tiber "continually waſhed away that point of the iſland on which "they ſtood.

(15*) Livy mentions two temples of Jupiter Stator; one vowed by Romulus, the other by the conſul Poſthumus Megellus. Tacitus counts that built by Romulus, among thoſe buildings which were deſtroyed by the fire in Nero's reign. The tranſlators have rendered this paſſage in ſuch a manner, as to give us to underſtand that the porticus of Metellus was in the temple of Jupiter Stator, inſtead of the latter being in the former; and that the former was the example Vitruvius inſtances, inſtead of the latter. It was the cuſtom of the ancients to build ſpacious walks and porticos about the temples, as we may learn from Chap. IX. of Book V. and from the fragments of the plan of Rome, now preſerved in the Capitol: but it is without all authority, or probability, to ſuppoſe that the porticus of Metellus ſhould have been incloſed within the temple, and that, ſo ſituated, it ſhould have been a proper example of peripteral temples.

(16*) Some will have it that this ſhould be read Hermodorus, becauſe it is well known that there was an architect of that name, he being mentioned by ſundry authors; whereas an architect of the name of Hermodus, is no where elſe mentioned. But as there may have been many able architects, whoſe names, or works, have not been tranſmitted to us, I think it not neceſſary to differ from the text.

(17*) There were in Rome ſeveral temples of Honour and Virtue; one of that name was built by Marius, in conſequence of his victory over the Cimbri, which it is ſaid he built in a very plain manner, having no taſte for the arts. This, therefore, is probably the temple to which Vitruvius alludes.

Fig. XIX. PSEUDO-DIPTEROS has in the front and in the poſticus eight columns, and in the flanks fifteen, including thoſe of the angles. The walls of the cell correſpond to the four middle columns of the front and of the poſticus; ſo that the ſpace of two intercolumns, and the thickneſs of one column, remains all round between the walls and the outer range of columns. No example of this is in Rome, but ſuch is the temple of Diana at Magneſia, built by Hermogenes of Alabanda, and that of Apollo by Mneſtæus.

Fig. XX. DIPTEROS is alſo octaſtyle[18*] in the pronaos,[19*] and in the poſticus, but has a double range of columns around the cell. Thus is the Doric temple of Quirinus,[20*] and the Ionic temple of Diana at Epheſus, erected by Cteſiphonte.[21*]

Fig. XXI. HYPÆTHROS is decaſtyle both in the pronaos and poſticus; in all other reſpects it is the ſame as dipteros, except that in the inner part alſo it has columns (F); two rows in the height, detached from the walls all round, like the periſtyle of a portico: Alſo the middle part (A) is left uncovered, and without a roof, and doors (C C) open both to the pronaos and to the poſticus. Of this there is no example in Rome; but ſuch is, at Athens, the octaſtyle temple, and that of Jupiter Olympius.[22*]

(18*) Octaſtylos ſignifies having eight columns; decaſtylos, ten columns; hexaſtylos, ſix; and tetraſtylos four columns in the front.

(19*) The pronaos is the porch or porticus in front of the temple, as the poſticus is that in the back front.

(20*) There were two temples of Quirinus at Rome; one on the hill of that name; the other on the Via Appia, without the city. It is ſaid, that which was within the city was always kept ſhut, to denote the ſecret and unknown end of Romulus, who after his deification was called Quirinus.

(21*) This name is variouſly wrote, as, Creſophon, Chryſyphon, Chreſipheon, Chteſiphrone, and Cherſiphon. In the preface to the ſeventh book, and at the ſixth chapter of the tenth book, Metagenes his ſon is alſo mentioned with him, as architect to the temple of Diana at Epheſus.

(22*) *Sed Athenis octaſtylos, & in templo Jovis Olympii*, are the words of the text, which I have rendered, *The octaſtyle temple at Athens, and that of Jupiter Olympius*; for it is not certain that we are to underſtand the word *octaſtylos* to relate to the temple of Jupiter Olympius, thereby determining that temple to be octaſtyle, as all the tranſlators have generally underſtood. On the contrary, it appears to me, that Vitruvius means ſome other temple by the word *octaſtylos*; for he diſtinguiſhes it from *in templo Jovis Olympii*, by an (&), as I find by Galiani's edition of the text, and by all the manuſcripts I have ſeen. There is alſo a ſimilar paſſage juſt below, *Divi Julii & in Cæſaris foro Veneris*, in which the diſtinction between the two temples is made by the ſame ſign, (&) and which the ſame tranſlators have all allowed to expreſs different temples; rendering it *the temple of the divine Julius, and that of Venus in Cæſar's forum*; although they might, with as much reaſon, have rendered this, *the temple of Venus in the forum of the divine Julius Cæſar*.

Thus much I had written when I ſaw the controverſy between Mr. Stuart and Mr. Le Roi, concerning the temple of Jupiter Olympius. I need not mention the ſeveral reaſons that might be alledged, why Vitruvius could not diſtinguiſh this temple any otherwiſe than by the number of columns in its front, or that it was ſufficient ſo to do; but will only mention ſome circumſtances, which make it probable that the temple of Jupiter Olympius was a decaſtyle temple.

Among the preſent ruins of Athens are ſeventeen Corinthian columns, (commonly called *the columns of Adrian,*) which Mr. Stuart, in his Antiquities of Athens, notwithſtanding the anſwer of Le Roi, has given ſufficient reaſons to believe are the remains of the temple of Jupiter Olympius; they ſtand on the ſpot aſſigned by the ancient writers to that temple.

Theſe ſeventeen columns are ſo diſpoſed, that the longitudinal diſtance of the two moſt remote from each other is that of nineteen intercolumns, and their intermediate columns; ſo that this temple muſt have had twenty columns in flank.

This circumſtance ſufficiently evinces that the front muſt certainly have had ten columns; for if there had been no more than eight in front, there ſhould have been but fifteen in flank, according to Vitruvius's principles; and but ſeventeen according to the cuſtom of the Greeks, who uſually placed in the flank one column more than double the number of thoſe in the front.

If therefore theſe columns are truly the remains of the temple of Jupiter Olympius, we cannot doubt of its having been a decaſtyle temple: and conſequently, that the word *octaſtylos* does not allude to that, but to ſome other Athenian temple.

CHAPTER II.

Of the Five Species of Temples.

THE ſpecies of temples are five, which are thus named; PYCNOSTYLOS, which has columns very cloſe; SYSTYLOS, a little more apart; DIASTYLOS, an ample diſtance; AREOSTYLOS, more diſtant than is proper; and EUSTYLOS, the juſt diſtribution of the intercolumns. PYCNOSTYLOS is that in whoſe intercolumns the thickneſs of one column and a half may be contained. In this manner is the temple of the deified Julius, and that of Venus in Cæſar's forum. There are alſo ſeveral others thus compoſed. SYSTYLOS is that in whoſe intercolumns the thickneſs of two columns may be contained, and the plinths of the baſes are equal to the ſpace which is between two plinths.* Thus is the temple of Equeſtrian Fortune, near the Stone Theatre; and ſeveral others are built in the ſame manner. Both theſe kinds are incommodious; for when the mothers of families, going to their ſupplications, have aſcended the ſteps, they cannot paſs arm in arm through the intercolumns, unleſs they paſs ſide-ways. The cloſeneſs of the columns alſo obſtructs the view of the door of the temple, and obſcures the ornaments; and the walks about the cell are inconvenient, by reaſon of their narrowneſs.

Fig. XIV. and XV. DIASTYLOS is that diſpoſition, in whoſe intercolumns the thickneſs of three columns may be placed. Thus is the temple of Apollo and Diana. This diſpoſition is attended with ſome inconvenience; for the Epiſtylium, on account of the width of the intercolumns, is liable to break.

Fig. XXXI. IN ARÆOSTYLOS, neither ſtone nor marble Epiſtyliums can be uſed, but beams of durable timber muſt be applied. The ſpecies of theſe temples are called *Baryta Barycephalæ*,* low and broad; and the ornaments of their faſtigiums are of fictile ware, or of braſs gilt in the Tuſcan manner. Thus, at the Circus Maximus, is the temple of Ceres, the Pompeianian temple of Hercules, and alſo that of the Capitol.*

(1*) Conſequently the projecture of the baſe will be a quarter of the diameter of the column, which is much greater than is uſually allowed by the modern maſters, who, in general, allow the projection to be no more than the ſixth part of a diameter, or thereabout. See *Fig. XXV.* No. 1. and 2.

(2*) From the Greek words, βαρυς, low or flat, and κεφαλη, head.

(3*) Perault tranſlates this paſſage thus: *aux temple de Ceres et d'Hercule, qui ſont proche le grand cirque, et au Capitole, qui eſt en la ville de Pompei.* The text is, *Uti eſt ad Circum Maximum Cereris, et Herculis Pompeiani, item Capitolii.* My tranſlation agrees nearly with that of Galiani; for Pliny informs us, that there was a temple of Hercules built by Pompey, near the Circus Maximus; as alſo a temple of Ceres near the ſame: and Livy, in ſeveral places, mentions a temple of Hercules in the Capitol. The Tuſcan temple, Fig. XXXI. is an example of this ſpecies, excepting that the columns are there but ſeven diameters high, whereas in Areoſtylos they are directed to be eight.

Now, returning to the EUSTYLE manner, which is the moſt perfect, and beſt ſuited to the purpoſes of convenience, beauty, and ſtrength; the ſpace of the intercolumns is made equal to the thickneſs of two columns and a quarter; and one intercolumn in the middle of the front, and another in the poſticus, is equal to the thickneſs of three columns. Thus the aſpect will be handſome, the acceſs free from impediment, and the walk about the cell commodious. This ſpecies is thus regulated: The place deſigned for the front, if the temple is to be made tetraſtyle, is divided into eleven parts and a half, excluſive of the footings, and the projecture of the baſes. If it is to be of ſix columns, it is divided into eighteen parts; and if deſigned to be octaſtyle, into twenty-four and a half. By theſe diviſions, whether it is tetraſtyle, hexaſtyle, or octaſtyle, one part will be a module, and one module will make the thickneſs of the columns. Each intercolumn, excepting the middle one, has two modules and a quarter; the middle one of the front and of the poſticus has three modules; and the heights of the ſame columns are to be eight modules and a half: ſo that, by theſe diviſions, the intercolumns will be juſtly adapted to the heights of the columns. We have no example of this ſpecies in Rome; but ſuch is the octaſtyle temple of Bacchus at Teos, in Aſia.[4*] This ſymmetry[5*] was eſtabliſhed by Hermogenes, who alſo firſt invented the principle of the octaſtyle pſeudodipteros; for, in the dipteral temples he ſuppreſſed the interior range of columns, in number XXXVIII.[6*] and thus leſſened both the expence and the labour. This made the walk about the cell exceedingly ſpacious, and in nothing impaired the aſpect; ſo that, without the aid of the ſuperfluous columns, the dignity of the whole work was preſerved; for the pteromatos,[7*] and the diſpoſition of columns about the temple, was contrived ſolely to the end that the aſpect might be enriched by the aſperity[8*]

Fig. XX.

(4*) Some remains of this temple are now publiſhed in the Ionian Antiquities.

(5*) Symmetry is here uſed in the ſenſe in which ſpecies was before uſed. I have nevertheleſs choſe to give the word of the text, that the reader may obſerve the different application of the words.

(6*) The manuſcripts in general have XXXVIII. but it is believed to be an error of the copyiſts, and that it ſhould have been written XXXIIII. that being the number of columns in the interior range, as will be eaſily ſeen in referring to the draughts, Fig. XIX. and XX. I cannot imagine any more probable way of agreeing with the number of the text, than by ſuppoſing the two columns between the Antæ in the pronaos, and the two in the poſticus, (marked 1, 2, 3, 4,) were alſo ſuppreſſed, which, added to thoſe of the inner range, will then make up the number thirty-eight. This may not be thought improbable, when it is conſidered, that the ſuppreſſion of theſe four columns correſponds with the intention, and promotes the end deſigned, by ſuppreſſing the whole inner range of columns, *(i. e.)* opening and enlarging the walks about the temple.

Le Roi, in his Ruins of Greece, accounts for it in another manner, which has ſome probability. With the Greeks it was a general rule to make the number of columns in the flanks of their temples one more than double the number of thoſe in the fronts; ſo that where there were eight in front, there were ſeventeen in flank; from whence it happened, that the columns in the interior range of Grecian dipteral temples were in number exactly thirty-eight.

The only objection to this ſuppoſition is, that Vitruvius has before deſcribed but fifteen columns in the flanks of dipteral temples; and it may be ſuppoſed he alludes to thoſe temples, according to his own deſcription, and the manner of the Romans, rather than according to the Greek manner, of which he has before taken no notice.

(7*) Pteromatos, ſee note 14, chap. vii. book IV.

(8*) Aſperity is a term Vitruvius uſes to expreſs the frequency and intermiſſion of the columns and intercolumns. Its application may be owing to the analogy there is between column and ſpace, and the intermiſſion of ſubſtance and ſpace, which is the cauſe of the aſperity or roughneſs of bodies. The French now uſe the word *aſprette* as a common technical term.

of the intercolumns; alſo, if a number of people ſhould be detained there by violent rains, they may wait in the temple, and about the cell, without inconvenience. This is the diſpoſition of pſeudodipteral temples: by which it appears that Hermogenes made a great and ingenious improvement, and has left an example from whence poſterity may deduce the principles of the ſcience.

The columns of Areoſtyle temples are ſo formed, that their thickneſs may be the eighth part of their height. In Dyaſtylos the heighth of the columns is divided into eight parts and a half, and one part is given to the thickneſs. In Syſtylos, the height is divided into nine parts and a half, of which one is given to the thickneſs of the column. In Pycnoſtylos, the height is divided into ten parts, and one makes the thickneſs of the column. But the columns of Euſtyle temples, like thoſe of the Dyaſtyle kind, are divided into eight parts and a half, and one part conſtitutes the thickneſs of the ſhaft at bottom. Thus the columns will be proportioned to the intercolumns; for, as the diſtances between the columns increaſe, ſo the thickneſs of their ſhafts ſhould be increaſed in proportion; for if, in the Areoſtyle ſpecies, the thickneſs of the columns ſhould be no more than a ninth or tenth part of their height, they would appear too thin and ſlender (9*); becauſe, on account of the width of the intercolumns, the air leſſens and diminiſhes, in appearance, the thickneſs of their ſhafts. On the contrary, if in pycnoſtylos, the columns ſhould have in thickneſs an eighth part of their heighth, they would, by reaſon of the cloſeneſs and narrowneſs of the intercolumns, have a ſwoln and

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(9*) Galiani, quoting Perault, remarks, that as there is the difference of a whole diameter between the height of dyaſtyle and ſyſtyle columns, and as the euſtyle ranks between thoſe two ſpecies, that the height of euſtyle columns ſhould alſo be in a mean proportion between both, and be nine diameters high, inſtead of being eight and a half.

This remark may be carried farther yet, and it may be hinted, that the euſtyle intercolumns may likewiſe be two and a half diameters, as the mean between thoſe of the dyaſtyle and ſyſtyle, inſtead of two and a quarter, which is nearer to the ſyſtyle: for it may be obſerved, that, notwithſtanding Vitruvius ſays, the thickneſs of the columns ſhould be proportional to their intercolumns, yet in the euſtyle ſpecies, the intercolumns (as preſcribed by him) incline moſt to the ſyſtyle, although the thickneſſes of the columns are wholly the ſame as the dyaſtyle. It might therefore be no bad regulation in the euſtyle ſpecies, to make the width of the intercolumns, as well as the proportional thickneſs of the columns, in the mean between thoſe of the dyaſtyle and ſyſtyle ſpecies; that is, the intercolumns two and a half diameters of the column, and the columns nine diameters high. From this paſſage, as well as from the ninth chapter of the fifth book, and elſewhere, we may collect, that, among the ancients, it was not the order, whether Doric, Ionic, or Corinthian, that determined the proportional magnitudes of the columns and their ſeveral members, but the ſpecies of intercolumniation made uſe of; and which latter was governed by the deſtination, ſituation, magnitude, and other circumſtances of the work. Vitruvius indeed fixes the heighth of Ionic columns to eight and a half diameters, the Doric to ſeven diameters, and the Corinthian to nine and one ſixth, where he treats of them ſeparately; yet, when he ſpeaks of their uſe in areoſtyle, dyaſtyle, and ſyſtyle work, he determines their proportion by the ſpecies of intercolumniation; and the proportion of their members, by their height, magnitude, place, &c. He alſo ſpeaks of the uſe of the Doric order in ſyſtyle and dyaſtyle work, in which the columns muſt be nine and a half, and eight and a half diameters high, notwithſtanding he gives but ſeven diameters to that order elſewhere.

Wherefore, in the examples antiquity has left us, we find Doric, Ionic, and Corinthian columns, and their members, of various proportions. In vain then do we ſeek to diſcover the principles which governed the ancients in proportioning their works, by comparing the ſeveral examples of the orders which they have left, when the order was not the circumſtance by which they determined their proportions; and in vain, therefore, do we endeavour to fix the proportions of parts, which never ought to be fixed or limited.

To enable us to make any probable inferences concerning the principles which determined the ancients in the choice of their proportions in any given example, we ſhould be acquainted with the deſtination, ſituation, and other circumſtances of the work, as at its firſt erection; without which, the dimenſions and proportions only will be uſeleſs, and our concluſions muſt be uncertain, if not erroneous.

deformed appearance; for ſymmetry ought to be obſerved in all kinds of work. The columns at the angles are alſo made a fiftieth part of a diameter thicker than the others; becauſe they, being more ſurrounded by the air, appear more ſlender: the deficiencies of the ſight muſt therefore be rectified by the judgment.

Fig. XXII. The diminution of the top of the column, at the hypotrachelium (10*), is thus regulated: If the column (a b) is not leſs than fifteen feet high, the thickneſs at bottom is divided into ſix parts, and five of thoſe parts are given to the thickneſs at the top. If the height is from fifteen to twenty feet, the bottom of the ſhaft is divided into ſix parts and a half, and five and a half of thoſe parts make the thickneſs of the column at the top. If it is from twenty to thirty feet, the bottom is divided into ſeven parts, and ſix of theſe make the diminution at the top. If it is from thirty to forty feet high, the bottom thickneſs is divided into ſeven parts and a half, of which ſix and a half is the meaſure for the diminution at the top. If it is from forty to fifty feet, it is divided into eight parts, whereof ſeven make the thickneſs of the hypotrachelium at the top of the ſhaft. And, if it is ſtill higher, the ſame proportional method is to be obſerved; for, as a greater heighth cauſes them to appear more diminiſhed, they are therefore to be corrected by an addition of thickneſs; beauty being the province of the eye, which, if not ſatisfied by the due proportion and augmentation of the members, correcting apparent deficiencies with proper additions, the aſpect will appear coarſe and diſpleaſing. Concerning the augmentation that is made in the middle of columns, which by the Greeks is called *Entaſis*, the manner of forming it juſt and gradual is ſhewn by the draught at the end of the book (11*).

(10*) The Hypotrachelium is the neck or upper part of the ſhaft of the column.

(11*) This draught, with all the others which Vitruvius annexed to his book, are loſt; we are therefore left unacquainted with the method the ancients uſed, in forming the ſwell or Entaſis of columns. All the commentators have taken it for granted, that Vitruvius intended the ſwell to be beyond the perpendicular of the bottom of the ſhaft, thereby making the column thicker in the middle than at the bottom; and it ſeems not to have occurred to them, that he might poſſibly mean, that the ſwell ſhould riſe from the inclined line that paſſes from the bottom of the ſhaft to the point of diminution at the top; although this latter is as conſonant to the text as the former, and is much more beautiful and conformable to the antique: they have therefore charged Vitruvius with inculcating a rule, which neither propriety, beauty, or the example of antiquity, recommends; and which gives the column ſo deformed and diſpleaſing an appearance, that few architects, if any, have thought proper to practiſe it.

Vitruvius has juſt told us, that columns are leſs at the top than at the bottom; conſequently a column, in his ſenſe, is a conical, not a cylindrical body. When, therefore, he ſays columns have ſuch a quantity of ſwell in the middle, he muſt mean that that conical body has ſuch a ſwell, or that the ſwell is from the conical or inclined line; and cannot mean from a cylindrical or perpendicular line, which he no where deſcribes. If he had deſcribed columns to be cylinders, then the cylindric or perpendicular line muſt have been underſtood; but, as he deſcribes them to be conical bodies, his words admit no other than the conical or inclined line to be accepted.

In many ancient columns yet remaining, we find the line which paſſes from the bottom to the point of diminution at the top, to be quite ſtrait; but in the greater part of thoſe in the Roman buildings, that line is obſerved to have a gentle ſwell or curvature; ſuch, in fact, as columns would have, were they formed according to the ſuppoſition that the ſwell deſcribed is to be underſtood to riſe from the aforeſaid inclined line (a b, fig. XXII.) and not from the perpendicular line (a o). Reaſon, beauty, and the example of antiquity, therefore, all conſpiring to ſupport this opinion, as much as to diſprove the other, it becomes more than probable that this was the meaning of Vitruvius.

From a paſſage at the end of this book we learn, that the quantity of the ſwell or entaſis in the middle of columns is equal to the ſize of one of the fillets between the channels.

CHAPTER III.

Of the Foundations, and of the Columns and their Ornaments.

FOR the foundation of theſe works, the ground muſt be dug down to the ſolid earth, and in the ſolid ſo far as ſeems needful for the magnitude of the building. The ſubſtructure muſt be made extremely ſtrong. The walls above ground, under the columns, are made thicker by half than the columns which reſt upon them, that the inferior may be ſtronger than the ſuperior, and that the baſes may not project beyond their ſupport.[1*] Theſe walls are called *Stereobatæ*, becauſe they ſuſtain the whole weight. The thickneſs of the walls above muſt alſo be wrought in the ſame manner, and the interval either vaulted or made ſolid by piling, whichever may be beſt approved. But if the place is found to be infirm, ſoft, and marſhy to the bottom, then it muſt be dug and emptied, and piles of alder, olive, or oak ſcorched, driven in by machines very cloſe together, and the intervals of the piles rammed with coal; after which the ſubſtructure is to be completed in the moſt compact manner.

Fig. XVIII. The foundation being raiſed, the ſtylobatæ (g) are all placed on a level, erecting the columns upon the ſtylobatæ, either in the pycnoſtyle, ſyſtyle, dyaſtyle, or euſtyle manner, as before deſcribed and determined. In the areoſtyle manner they may be diſpoſed at pleaſure. In peripteros the columns are ſo ordered, that as many intercolumns as there are in front, twice ſo many of the ſame intercolumns are made in the flanks; and thus the length of the work will be double its breadth. Thoſe who make the number of columns double, miſtake; becauſe, in that caſe, the length will be one intercolumn too much.[2*]

The channels, as well as fillets, are uſually twenty-four in number, and the latter are to the former as one to three; one fillet muſt therefore be equal to the ninety-ſixth part of the circumference of the column, or about the thirtieth part of the diameter, which therefore muſt be the quantity of the ſwell in the middle of the ſhaft.

The method of deſcribing it may be as follows. A ſtrait line (a b fig. XXII.) being drawn from the bottom of the ſhaft to the point of diminution at top, that line is divided, and at the middle the quantity (c p) of the ſwell is marked off outwardly; a regular curve, or portion of a circle, is then drawn, paſſing through thoſe three points, the bottom (a), the top (b), and the entaſis in the middle (p).

(1*) Vitruvius has before mentioned, that the baſes project a quarter of a diameter of the column beyond the ſhaft; ſo that the projection of the baſe on both ſides, added to the diameter of the column, is equal to one diameter and a half of the ſaid column.

(2*) All the commentators have obſerved, that if the number of intercolumns in front are doubled, the length of the temple will not even then be exactly twice its breadth, but will be one diameter of a column ſhort of twice its breadth. This is true, if we meaſure to the outſides of the columns both ways; but if we reckon from the centers of the columns either way, which ſeems to be Vitruvius's intention, his rule is perfectly juſt, and agrees, in this reſpect, with the ancient temple of Concord at Rome, and that of Niſmes in France. The Greeks differed from the Romans in this matter, and generally placed in the flanks of their temples one column more than double the number of thoſe in the front.

Fig. XVIII. THE ſteps (h) in front are ſo contrived, that they may be always of an odd number, that the right foot aſcending the firſt ſtep, may alſo be firſt placed on the pavement of the temple. The ſize of the ſteps, I judge, ſhould be ſuch, that they may not be thicker than the dextant; nor thinner than the dodrant[3*]; for, in that caſe, the aſcent will not be tireſome. The breadth of the ſteps is made not leſs than a foot and a half, nor more than two feet. If ſteps are diſpoſed all round the temple, the ſame rules ſhould be followed; but if a podium[4*] is made round three ſides of the temple, it is ſo formed, that its plinth (l); baſe (o), dye (r); corona (s); and lyſis,[5*] may agree with the ſame ſtylobata which is under the baſes of the columns[6*].

Fig. XXII.

THE ſtylobatæ ſhould be wrought in ſuch a manner, as to leave in the middle the adjection for the unequal ſcamilli; for, if directed level, it will ſeem to the eye to be channelled. But

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(3*) The dextant is the five ſixths of any meaſure, as the dodrant is the three fourths. Galiani argues on it as a doubtful matter, whether we are here to underſtand them to be parts of a foot or of a palm. I cannot have a doubt but that they ſhould be underſtood to be parts of the foot; becauſe Vitruvius, immediately after, gives the breadth of the ſteps in feet; and it is not very probable that he would give the thickneſs in one meaſure, and the breadth immediately after in another: beſides, the Roman palm, being only a quarter of a foot, was too ſmall a meaſure to admit a ſuppoſition that the ancient ſteps were ſo diminutive as to be a portion thereof. The Roman foot was eleven ſix tenths of our foot; conſequently the dextant of their foot was a little ſhort of ten inches of our meaſure, and the dodrant a little ſhort of nine inches. The ancient ſteps, therefore, were much higher and broader than thoſe now uſed by the moderns. In one of the ancient temples ſtill remaining at Athens, the ſteps are of the meaſure here aſſigned; and in the remains of ſome temples at Peſtum in Italy, they are much larger.

Perault has accepted the word *retractiones* for the landings between the ſteps, which here only ſignifies the breadth or tread of the ſteps, as Galiani ſufficiently evinces and corrects.

(4*) The Podium is the continuation of the pedeſtal through the intercolumns, or, as we call it, the *Dado*.

(5*) It is not agreed on, what member Vitruvius means by the word *lyſis*; he uſes it again at chap. vii. book V. and at chap. xi. book VI. at which laſt place he applies it to fractures in buildings. To judge from the order in which the parts of the ſtylobatæ are named, it ſhould be ſome member above the corona; and may therefore be the ogee or cymatium, or, as ſome think, the weathering or ſlope above the cymatium, which lays on the corona.

(6*) Galiani explains this paſſage, by ſuppoſing, that the ſtylobatæ were raiſed above the pavement of the temple; but that was very rarely practiſed by the ancients, as is evident from the examples which have come to our knowledge. The tops of the ſtylobatæ were uſually no higher than the pavement of the temple, and the height of the ſteps determined the height of the ſtylobatæ.

Vitruvius ſpeaks of temples that had ſteps all round, and of another kind that had ſteps only in front, with a continued podium round the other three ſides. As in this latter caſe there appears no occaſion for ſtylobatæ, becauſe the podium is the ſupport of the columns, and as Vitruvius has mentioned ſtylobatæ under the columns, beſides mentioning the podium, Galiani has been induced to believe, that Vitruvius alluded to an inſtance where the ſtylobatæ were raiſed upon the pavement of the temple, and above the top of the ſteps: but the fact is, as we may gather from the context, that ſtylobatæ were always firſt built under the columns, whether the temple was to be encompaſſed with a podium, or with ſteps; in the latter caſe, they were only plain ſquare piers, hidden by the ſteps; in the former, they had their *quadræ*, *ſpiræ*, and *corona*, on the outer part. The podium walls were afterwards built between them, fluſh outwardly, but not inwardly; it not being neceſſary to make the podium ſo thick as the ſtylobatæ which ſupported the columns; and theſe podium walls had, as Vitruvius ſays, their plinth, baſe, corona, &c. correſponding with thoſe on the external part of the ſtylobatæ. This is confirmed by an ancient temple at Cora in Italy, where the ſtylobatæ under the columns ſtill remain, although the podium that was built between them is fallen; and which ſtylobatæ appear to have been built of ſtones ſuited to their own dimenſions, and unconnected with the adjoining podium.

the manner of properly forming theſe ſcamilli will be ſhewn by the figure and deſcription at the end of the book.

(*) This paſſage concerning the ſcamilli is univerſally allowed to be one of the moſt obſcure and unintelligible parts of the whole work, and has much employed the thoughts of the tranſlators and commentators of this author to explain. Baldus has written a treatiſe, intitled *Scamillos impares*, purpoſely to explain it. He ſuppoſes the ſcamilli to be ſubplinths, ſituated under the ordinary plinths of the baſes of the columns, forming a double plinth under the ſame, as is ſeen in the temple of Fortuna Virilis at Rome. Baptiſta Bertanus ſuppoſes them to be projections in the dye of the ſtylobatæ, like the ſeveral faces of the architrave, and to which they alſo anſwer in the perpendicular. Some have thought the ſtylobatæ to have a protuberance in the middle of the face or dye, like the ſwelling of a circular friſe; and others ſuppoſe the ſcamilli to be nothing more than the projections of the podium under each column, forming a ſtylobata to every column, inſtead of one continued and uninterrupted podium; and they account for the appearance of channelling, which Vitruvius ſpeaks of, by ſuppoſing the receſſes, which are formed by the alternate projection and receſs of the podium, to be the channelling meant; or elſe that the dye itſelf is the channel, as being ſunk between the projection of the capping and baſe mouldings. But it was not the practice of the ancients to make ſuch breaks in the podium of temples, as has before been noticed; and the other ſuppoſitions are ſo foreign to the ancient manner, that they are far from being ſatisfactory, or even plauſible.

The order Vitruvius obſerves in mentioning the ſeveral parts of the fabric, beginning from the foundation, and riſing part by part, as they are ſituated next in height, is a powerful, and, I could almoſt ſay, inconteſtible, argument, to prove, that the ſcamilli are ſituated between the tops of the ſtylobatæ and bottoms of the baſes of the columns; and the meaning of the word ſcamillus, which is that of a little bearer, footſtool, or riſer, intimates that they are ſome kind of bearer, upon which the columns may ſtand, ſo far agreeing with the ſuppoſition of Baldus. Vitruvius gives us to underſtand, that they are an addition in the middle of the ſtylobatæ, or, more ſtrictly, that the addition is left for them, and that regard muſt be had thereto in working or levelling the ſtylobatæ, ſo as to leave that addition; but he does not ſay whether this addition is to be in the middle of the top, or of the front, or of the ſide, &c. However, the argument before mentioned ſufficiently evinces, that it is the middle of the top or horizontal ſurface which is meant.

Another circumſtance Vitruvius mentions concerning them is, that if this top of the ſtylobatæ is made level or ſtrait, it will ſeem to be channelled or grooved. Here the ſuppoſition of Baldus fails: it cannot appear channelled, however the top of the ſtylobatæ may be wrought; nor does it agree in the inequality or diſſimilarity which Vitruvius aſcribes to the ſcamilli, calling them *ſcamillos impares*. Theſe circumſtances, and a paſſage farther on, which mentions ſome relation the ſcamilli have to the epiſtylium or architrave, are the great obſtacles and difficulties of the ſolution.

There might be ſeveral devices, very different to each other, offered, that would agree with the circumſtances of the deſcription more or leſs aptly; but the deſcription itſelf is not ſufficiently explicit to enable us to determine on any one with certainty; and no antique example has yet been noticed that can aſſiſt us in the inveſtigation. As one of the moſt probable, out of many, which have occurred to me, and as it differs from all others that have been offered for explaining this difficulty, I mention the following, leaving it to the world to decide on its probability or value.

I have before aſſented to the opinion of Baldus ſo far as to allow the ſcamillus to be a riſing or adjection on the level top of the ſtylobatæ; but I do not agree with him in ſuppoſing it to be a ſubplinth. My notion is, that it is a ſmall riſing, ſcarcely ſo high as one of the fillets of the baſe is thick, and its meaſure horizontally ſomething leſs than the ſquare of the plinth of the baſe which reſts on it, as (m, n, fig. XXII.)

With regard to the uſe of this riſing, or ſcamillus, I ſuppoſe it to be the ſame as that ſimilar ſmall riſing or adjection (i, k), uſually found between the capital and architrave, in many of the ancient buildings; viz. to prevent rupturing the edges of the baſe, to correct the minute inequalities in the heights of the columns, ſo as to preſerve the level of the epiſtylium, and to give the columns on the flanks that inclination inward which Vitruvius directs; for it is to be expected as unavoidable, that, in working ſo great a number of columns as were placed around peripteral temples, ſome ſmall inequalities of height would happen, eſpecially in caſes where the columns were wrought at the quarry, at a great diſtance from the building, as was often the caſe.

To ſuch purpoſes ſuch adjections or ſcamilli were perfectly adapted, and may even be ſaid to be neceſſary, and they will anſwer to every circumſtance of the deſcription.

For, 1ſt, With regard to their inequality or diſſimilarity, theſe adjections on the ſtylobatæ being left ſufficiently high, and afterwards worked down more or leſs, ſo as to ſuit the height, or the inclined poſition of the columns reſting upon them, they of courſe become unequal in their thickneſſes or heights, on account of the unequal heights of the columns, as well as on account of their inclined poſition, which conſequently occaſions the adjection to be higher under ſome columns than under others, and on one ſide than on the other. 2d, They appear as if channelled or grooved, becauſe their meaſure is a little leſs than the ſquare of the plinth of the baſe, in order to avoid rupturing the edges of the ſaid plinth; wherefore there appears to be a groove or channel between the ſtylobatæ and the baſe of the column, which will ſeem to be wrought on purpoſe, provided the

Fig. XXVI. No. 1. THIS done, the baſes are fixed in their places; and are ſo proportioned, that, including their plinth, they have in height half the thickneſs of the column; and in projection, which the Greeks call *Ecphoran*, a quarter; ſo that their breadth and length will be once and an half the thickneſs of the column. Their height, if they are to be in the Attic mode, is ſo divided, that the upper part is one third of the thickneſs of the column, and the remainder is left for the plinth (t). The plinth being excluded, the remaining part is divided into four parts, and the upper torus (t) has one fourth; the remaining three parts are equally halved, and one half makes the lower torus (t t), and the other the ſcotia (s), which the Greeks call *Trochilon*, with its ſquares.

Fig. XXIV. No. 1. BUT if the baſes are to be made in the Ionic mode, they are ſo proportioned, that their meaſure on every ſide be equal to the thickneſs of the column, added to a quarter and an eighth of the ſaid thickneſs. The heighth is the ſame as in thoſe of the Attic kind; ſo alſo is the plinth. Excluding the plinth, the remainder, which will be equal to the third part of the thickneſs of the column, is divided into ſeven parts, of which three are for the torus (t) that is at the top; the remaining four parts are equally halved, and one part makes the upper trochilus (s), with its aſtragals and ſupercilium[8*], and the other part is left for the lower trochilus (s s); but the lower one appears to be the largeſt, becauſe it projects to the extremity of the plinth[9*]. The aſtragals are the eighth part of the trochilus. The projecture of the baſes is an eighth, and a ſixteenth part of the thickneſs of the columns.

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line is made ſtrait or level; for otherwiſe it would appear as a defect or accident. In this manner the adjections are found between the capital and architrave in the temple on the Iliſſus at Athens are formed, as (i k, fig. XXII.); though in the Roman buildings, as in the portico of Octaviä, the temple of Antonine and Fauſtina, the Thermæ of Diocleſian, &c. they are made larger than the incumbent epiſtylium. Laſtly, concerning the correſpondence theſe adjections have to the epiſtylium: As it has been made appear with the greateſt probability, that the adjections muſt be a kind of flat horizontal bearers, which are covered by the immediately incumbent baſes, it is evident, that the correſpondence alluded to cannot conſiſt in any apparent ſimilarity of form between them and the members of the epiſtylium, as it has been generally ſuppoſed; the adjections can only be more or leſs high, and, of courſe, the incumbent parts more or leſs raiſed, ſo as to correſpond to the level of the epiſtylium; and this, I imagine, is all the correſpondence alluded to between the adjections in the ſtylobatæ and the members of the epiſtylium, that is meant by Vitruvius. But this will be farther diſcuſſed at Note 17.

I know not to what it may be imputable, that none of theſe adjections have been found, or at leaſt noticed, under the baſes of the columns in any of the antique edifices; they are found very frequently over the capitals. Indeed, the moldings of the baſes are generally more mutilated and confuſed, which may prevent the obſervation of ſo ſmall a member, and may make it appear of one piece with the decayed face of the plinth. They alſo may not have been uſed under the baſes in all buildings, as they were not in all buildings uſed over the capitals. In the Sybil's temple at Tivoli, there are ſuch adjections to be ſeen under the torus of the baſes, (for they have no plinth), which is the only inſtance I know of in which there is any appearance of them; and, in this temple, the columns have that inclination inward which Vitruvius directs. See note 17, enſuing.

(8*) Supercilium ſignifies in general any ſuperior molding that crowns or terminates another member. In this caſe, it muſt mean ſome molding reſting upon the ſcotia; but what particular molding cannot be aſcertained.

(9*) Vitruvius ſays, the lower trochilus appears larger on account of its larger projection, or (in his own words) becauſe it projects to the extremity of the plinth. This implies, that it is in fact no higher than the upper trochilus; and, if ſo, it muſt have its aſtragals and ſupercilium, as well as the upper trochilus. Alſo, as aſtragals are mentioned in the plural, it follows, that there muſt be two aſtragals to each trochilus. Again, as the trochilus muſt be terminated by ſome member both at top and bottom, and as the proportions of the aſtragals are mentioned, and no notice taken of the ſupercilium, it is probable that one aſtragal was at top, and the other at the bottom; and that the aſtragal at top is the molding here called the SUPERCILIUM; for, if the ſupercilium was any diſtinct molding, it is to be ſuppoſed that Vitruvius would have mentioned its proportion, as well as that of all the other moldings in the baſe.

The baſes being compleated and fixed, the middle columns both of the pronaos and poſticus are to be ſet perpendicularly on their axis; but thoſe which are ſituated at the angles, and thoſe on the flanks of the temple, to the right and left, have their inner faces, which are toward the walls of the cell, diſpoſed perpendicularly, and their outer faces diminiſhed as directed; for, by this means, the temple will have a juſt and proper diminution.*

Fig. XXIV. and XXV. The ſhafts of the columns being erected, the capitals, if they are to be of the pulvinated* kind, are to be made as follows: The Abacus is in length and breadth (a b) equal to the thickneſs of the bottom of the ſhaft, added to an eighteenth part thereof; and the heighth (d c), including the volutes, is the half. At the extremity (a) of the Abacus, an eighteenth part and a half (a d) is to be ſet back toward the inner part of the faces of the volutes; and from thoſe four points, near the extremes of the Abacus, four lines (d c), which are called *Cathti*, are drawn downward. Then the thickneſs (d c) is divided into nine parts and a half, and of theſe nine parts and a half, one part and a half is left for the thickneſs (d f) of the Abacus, and the remaining eight are reſerved for the Contour of the volute. After this, the lines (d c), which are drawn down, at the extremes of the abacus, and recede inwardly one part and a half, are ſo divided, that four parts and a half are left under the abacus; and at that point which ſeparates four parts and a half from three parts and a half, the center of the eye (i) is marked, and round this center a circle is drawn, equal in diameter to one of the eight parts. This will be the ſize of the eye, and in this cathetus the correſponding diameters* are wrought. Then beginning at top, under the abacus, in the ſeveral operations of the quarters, the halved ſpace of the eye is diminiſhed, till it returns to the ſame quarter under the abacus.

Fig. XXIV. and XXV. The thickneſs of the capital is ſo divided, that, of nine parts and a half, three fall below the aſtragal (F) at the top of the ſhaft. The parts above are left for the cymatium,* abacus (f), and channel (H). The projecture (n) of the cymatium, beyond

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(10*) The text does not explain whether in theſe columns on the flanks the diminution on the outſide is equal to the whole quantity of the diminution made on both ſides of the other columns, or only the quantity made on one ſide; but moſt probably the whole quantity is meant: for otherwiſe theſe columns would be larger at the top than the others, which would cauſe a diſproportion and diſſimilarity in the capitals, and in the ſoffite of the epiſtylium. The columns of the Sybil's temple at Tivoli, are thus inclined, and have the whole diminution on the outer face.

The columns which are to be inclined are, I imagine, to be properly diminiſhed, before they are erected; and the proper inclination is then given them, by diſpoſing their axes out of the perpendicular ſo far, till the top of the ſhaft on the inner ſide becomes perpendicular with the bottompart.

(11*) Pulvinated, or bolſtered, is a term applied to the Ionic capital, on account of its volutes reſembling the ends of matraſſes rolled up in the form of bolſters or cuſhions.

(12*) By *reſpondens diametros*, correſponding diameters, I ſuppoſe, we are to underſtand, correſponding centers; *(i. e.)* the centers which turn the ſeveral contours of the volute.

Theſe central points are ſaid to be in the cathetus of the eye: wherefore it ſhould ſeem that the method of turning the volute here intimated, is like that given by Serlio, where all the central points are formed in the cathetal line, within the diameter of the eye. This method, however, gives an unhandſome oblique direction to the volute, and is not to be recommended.

(13*) The molding, here called the *cymatium*, is judged to be the echinus, or ovolo, (G, fig. XXIV. and XXV.

the ſquare of the abacus, is equal to the ſize of the eye. The balthei[14*] (e) of the bolſters have ſo much projecture from the abacus, that, when one foot of the compaſſes is placed in the quarter of the capital (m), and the other extended to the extremity of the cymatium (n), the circumferent line (n e) may touch the extreme parts of the balthei. The axes of the volutes (g) are no thicker than the ſize of the eye, and the volutes are ſo inchaſed, that the depth is the twelfth part of their breadth. Theſe are the proportions of capitals for columns not more than fifteen feet high[15*]; thoſe which are higher have their ſymmetry accordingly.

The abacus will be in length and breadth equal to the thickneſs of the bottom of the column, and one ninth part[16*]; ſo that, as the higher the column is, the leſs is its diminution,

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(14*) The balthei, which ſignify bands or girdles, may probably be the moldings (e), which begirt the bolſter or profile of the volutes.

(15*) The receſs (a d) of the cathetal line from the extremity of the abacus, as deſcribed by Vitruvius, has been generally thought too much, being one part and a half of the eighteen parts, into which the bottom of the column is divided, cauſing the cymatium or ovolo to have a very large projection. Some therefore have ſuppoſed the text to have been corrupted: and Palladio Alberti, Vignola, and ſome others, have allowed it but one eighteenth part, intirely ſuppreſſing the half part. Scamozzi and Barbaro have given it one part and a quarter. The projection may be large, but it nevertheleſs ſeems to be ſuch as was intended by Vitruvius; for it makes the projecture of the abacus no more than equal to its heighth, which is conformable to his general rule in all moldings.

As the draught of this capital, as well as the other figures, which Vitruvius annexed at the end of his book, are loſt, it is not poſſible from this brief deſcription to underſtand perfectly his method of forming the volute. What has been ſaid above, at note 12, encourages an opinion, that it is ſomething like Serlio's. On the other hand, his ſpeaking of the operations of the ſeveral *quarters*, makes it ſuppoſable that it is one of thoſe methods in which each point turns a quarter circle only; whereas, if all the points are in the cathetal line, as in Serlio's method they are, each point muſt turn a ſemicircle.

There are many different methods in uſe for turning the Ionic volute, which are deſcribed in the many books of architecture now extant, and to which therefore I refer the reader. Nicholas Goldmanno has publiſhed a tract concerning the Ionic volute of Vitruvius, where he ſuppoſes he has diſcovered Vitruvius's method. It is nearly like that method given by Mr. Riou in his Grecian orders, and ſaid to be the ſame by which the volutes of the Ionic temple on the Iliſſus at Athens were formed.

The method given by Galiani in his tranſlation of Vitruvius, appears ſimple, eaſy, ingenious, and very conformable to the words of the text; but the centers are ſo diſpoſed, that the contours of the ſeveral quarters do not coincide in a right line, but form angles where they meet each other.

I ſhall here deſcribe a method of turning the Ionic volute, that has occurred to me, as it is eaſy to practiſe, and gives the volute a fine contour, very nearly agreeing with that of the theatre of Marcellus, according to Deſgodetz, which has never yet been decyphered. The eye being drawn, according to Vitruvius's inſtructions, the cathetal line (o p, fig. XXV.) is put on the diagonal, (*i. e.*) on an angle of 45), the upper part leaning outward, and continued indefinitely; then, on this line, the eye is divided into four equal parts, 1, 2, 3, 4, which are the centers for turning the volute. The point 1, where the diagonal cathetus interſects the lower part of the circumference of the eye, turns from its perpendicular f, at the bottom of the abacus, till it meets the diagonal cathetus at o. The point 2, diametrically oppoſite, is the center that turns the ſemicircle o p; the point 1 again turns the next ſemicircle p q; 3 turns the next q r; 4 the next r s; 3 again turns the next s t; laſtly, taking the middle 5 between t and 2, 5 becomes the laſt center, turning the ſemicircle t 2.

If the diagonal cathetus is turned on the other ſide, the perpendicular, that is, the under part, being directed outward, as from (u) to (u), the ſame proceſs will deſcribe an oval volute, having its longeſt diameter the contrary way.

(16*) The meaſure of the abacus was before ſaid to be a diameter and an eighteenth, here it is ſaid to be a diameter and a ninth; this the commentators account for, by ſuppoſing the former to relate to columns under fifteen feet, and the latter to all above that heighth; thereby ſuppoſing that the projection of the capital ſhould be greater, in proportion as it is ſituated higher; which ſeems to me to be contrary to the intention of Vitruvius.

For Vitruvius ſpeaks a little below of encreaſing the proportional heighths of members that are ſituated in high places; and for the ſame reaſon as the heighths are encreaſed, the projectures in ſuch ſituations ſhould be diminiſhed. He

for the ſame reaſon the capital is not without its due limitation of projecture, and its proportional addition of heighth. Concerning the deſcription of the volute, the draught and method of properly turning it with the compaſſes is ſhewn at the end of the book.

THE capitals being finiſhed, they are then fixed on the top of the ſhafts of the columns, not according to the level, but according to the equal modulary proportion; that an adjection like that made in the ſtylobatæ, may, in the upper parts, correſpond to the ſymmetry of the epiſtyliums.[17*]

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alſo fixes the projecture of the epiſtylium to be ſo much in all caſes as ſhall make it perpendicular to the diameter of the column at bottom; by which it ever becomes proportionally leſs in projecture, as its ſituation is higher. See note 18.

This therefore directly oppoſes the opinion that the abacus ſhould be proportionally larger, as the column is higher, and is a reaſon for believing it ſhould be quite the contrary.

The commentators have been led into this opinion by the ſentence following: *Uti quo minus habuerit altior columna contractum,* EO NE MINUS HABEAT CAPITULUM QUÆ SYMMETRIÆ PROJECTURAM, *& in altitudine recte partis adjectionem*; they accepting *ne minus* for *more*; whereas it is, in my opinion, uſed only in the ſame ſenſe as *nec minus*, or *non minus*, is frequently uſed in divers other places, viz. for *not leſs than the reſt, neither, as well as*, &c.

As therefore it is doubtful which of theſe two dimenſions is the right, and Vitruvius's rule for the proportion of the abacus of courſe remains uncertain, we muſt apply to the works of the ancients for information, and by their help form our opinion.

In the temple of Fortuna Virilis at Rome, the abacus of the column is a diameter and an eighteenth, its heighth from the ground is thirty-ſix feet French, and the proper heighth of the column is twenty-five feet.

In the theatre of Marcellus, the abacus is a diameter and a thirtieth, its heighth from the ground is fifty-four feet, and the column is twenty-two feet high.

In theſe two examples therefore we find the abacus is proportionally leſs, as its real height is greater, agreeing with the implication of the context, and directly oppoſing the conſtruction of the tranſlators.

By this it appears, that the firſt mentioned proportion of the abacus, viz. a diameter and an eighteenth, is moſt probably the true one, and the latter the miſtake; and alſo, that *ne minus habeat capitulum ſuæ ſymmetriæ projecturam*, muſt be underſtood to ſignify, that the proportional meaſure of the abacus muſt be diminiſhed, not encreaſed, in proportion as the columns are higher. And, laſtly, if the latter meaſure, viz. a diameter and a ninth, ſhould not be a miſtake, it more likely is meant for the meaſure of the abacus of columns fifteen feet high and under, and the former meaſure for thoſe which are above that heighth.

(17*) This is the paſſage before referred to, wherein the adjection in the ſtylobatæ is again mentioned.

In this place it is ſignified, that in fixing the capitals on the columns, the level is not regarded, but the equalem modulum only; (that is, the equal and proportional heighths of the columns, according to the number of modules aſſigned) to the end that the adjection mentioned may correſpond to the epiſtylium. Hence the correſpondence the adjection has with the epiſtylium muſt be of ſuch a kind as ſuffices or anſwers for the want of levelneſs in the capitals; and the adjection muſt be ſomething adapted to ſuch a correſpondence; for the epiſtylium muſt indiſpenſably be ſupported level.

If then the tops of the capitals of the columns that ſupport the epiſtylium, are, when fixed, not all on a level, ſome means muſt be found to make them ſo, or to anſwer the deficiency.

Vitruvius ſays the adjection is to anſwer this end; it muſt therefore be a kind of raiſer or bearer of an unequal thickneſs, according as the tops of the capitals vary from the level, ſo as to cauſe the tops of the capitals to correſpond with the level of the epiſtylium; which is, I imagine, all the correſpondence of the adjection to the epiſtylium that is meant.

Thus far it favours the former opinion concerning the nature of this adjection or ſcamillus.

But this paſſage has, in my conception, a different ſignification to that given it by the commentators in general. They have interpreted it, ſo as to import, that the adjection in the ſtylobatæ has ſome correſpondence with the epiſtylium, and the ſuperior members. I underſtand, that the adjection in the ſtylobatæ is here ſpoken of only by way of compariſon, and that it is another ſimilar adjection (here directed to be made), which is ſaid to correſpond with the epiſtylium, or ſuperior parts.

The reading is, *Uti quæ adjectio in ſtylobatis, facta fuerit in ſuperioribus membris, reſpondeat ſymmetria epiſtyliorum*, which is ambiguous, and will admit of both conſtructions; the reaſons therefore which have governed my choice are thoſe ariſing from the concurring circumſtances of the context.

Vitruvius directs the columns on the flanks of the temple to have their axes inclined out of the perpendicular. The axes of the capitals and baſes muſt undoubtedly coincide with thoſe of the columns. The top ſurface, or bed of the

THE proportion of the epiſtylium (A D) is as follows: If the columns are from twelve to fifteen feet, the heighth of the epiſtylium is half the thickneſs of the bottom of the column: If from fifteen to twenty feet, the heighth of the column is divided into thirteen parts, and one part makes the heighth of the epiſtylium. If from twenty to twenty-five, the heighth is divided into twelve parts and a half, of which one part makes the heighth of the epiſtylium. If from twenty-five to thirty feet, it is divided into twelve parts, and one part makes the heighth. In this manner, according to the heighth of the columns, the heighth of the

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capital, and that of the baſe, being at right angles with their axes, will therefore be out of the level. This circumſtance makes it indiſpenſably neceſſary to have ſome projection, bearer, &c. on the tops of the capitals, as well as under the baſes of thoſe columns, to rectify that obliquity, and preſent a level bed to the ſoffitè of the epiſtylium. Likewiſe the unavoidable minute inequalities in the heights or levels of the perpendicular columns, as well as for other reaſons before mentioned, make the ſame contrivance very proper, uſeful, and requiſite in thoſe columns alſo. Accordingly, we find the ancients generally uſed ſuch adjections or bearers on the tops of the capitals, as the remains of their works ſufficiently evince, in the manner (i k), fig. XXII.

Adjections on the capitals being then ſo neceſſary, convenient, and generally uſed by the ancients, it is ſcarcely to be ſuppoſed that Vitruvius would omit to ſpeak of them, eſpecially, as he has before ſpoken of a ſimilar minutia in the ſtylobatæ.

It has been before noticed, that Vitruvius treats of each part of the fabric according to the order of its height, beginning from the foundation; and ſo proceeding upward. He ſpoke of the adjection in the ſtylobatæ, between the ſtylobatæ and the baſe: here he ſpeaks of an adjection again, between the capital and the epiſtylium, which is the proper place of the adjection on the capital, and in which place they are found in the ancient remains.

Hence it is highly probable, that this latter adjection, which he here mentions, is that between the capital and epiſtylium, and not the ſame adjection that was before mentioned in the ſtylobatæ. But the next argument may be more convincing, if not deciſive.

It is ſaid, in fixing the capitals, the level is not regarded, to the end that the adjection (which ever it is) may, in the upper parts correſpond to the epiſtylium.

The nature of the correſpondence between the adjection and the epiſtylium has been before demonſtrated. The adjection in the ſtylobatæ cannot have ſuch correſpondence; for, however it may be formed, it cannot raiſe the declined bed of the capitals of the inclined columns to a level, without reverſing the inclined poſition of the columns, and cauſing them to lean outward inſtead of inward. This will be readily perceived upon a little reflection.

It cannot be ſuppoſed that the nature of the correſpondence between the adjection and the epiſtylium conſiſts in a ſimilarity in figure or meaſure, as has been heretofore ſuppoſed by former tranſlators; for the words, *The capitals are not fixed level, to the end that the adjection may correſpond to the epiſtylium*, imply a mutual relation and dependence between the manner of fixing the capitals, and the correſpondence of the adjection to the epiſtylium; but a correſpondence of figure, &c. between the adjection and epiſtylium can have no relation or connexion to any manner of fixing the capitals on the columns, ſo that the reaſoning would be totally incoherent; and it might as rationally be ſaid, the capitals muſt be fixed level, to the end that the foundation may be well built.

Hence the adjection alluded to cannot be that in the ſtylobatæ; it follows that it muſt be ſome other, and the order of mentioning it, as well as the uſe aſcribed to it, (which no other would anſwer), prove it to be that adjection generally uſed by the ancients on the tops of the capitals.

Thus conſidering it, we ſhall find all circumſtances agree; for there is certainly a mutual relation and dependence between the manner of fixing the capitals, and the correſpondence of ſuch adjection to the epiſtylium; for this adjection is the medium that reconciles the different levels of the beds of the capitals and the bed of the epiſtylium; and thus the reaſoning of the text becomes coherent and juſt; and the words *ſuperioribus membris* become pertinent, which otherwiſe ſeem ſuperfluous and unneceſſary.

Galiani confeſſes not to underſtand this paſſage, nor what can be meant by Vitruvius's injunction not to obſerve the level, but the *equalem modulum* only, in fixing the capitals.

The foregoing ſufficiently explains the meaning of that injunction; *viz.* that the capitals are to be ſo fixed on the columns, as to preſerve the due heighth of the columns, according to the number of modules aſſigned equal in all, preſerving the coincidence of their axes, &c. without regarding the level of the epiſtylium, or that of their own bed, which deficiency is to be rectified by the adjection or ſcamillus mentioned.

If then the above arguments are allowed to be juſt, and it is ſufficiently clear that the adjections here alluded to are thoſe generally uſed by the ancients on the tops of the capitals, whoſe nature and form are well known; it follows that thoſe in the ſtylobatæ are of the ſame kind, (for Vitruvius compares them together): and thus the long conteſted argument concerning the uſe, form, and preciſe ſituation of the ſcamilli impares will be determined.

epiſtyliums is proportionally determined; for, when the ſight is directed upward, it does not ſo eaſily penetrate the denſity of the air, but glances over the altitudinal ſpaces, and its ſtrength being impaired, it makes an uncertain judgment of the dimenſions. Wherefore a proportional addition is ever to be made to the members, when the building is ſituated high, or is of a Coloſſal magnitude. The breadth of the epiſtylium at the bottom part, which reſts upon the capital, is made equal to the thickneſs of the top of the column, juſt under the capital; and the top (of the epiſtylium) is equal to the bottom of the (ſhaft of the column.) The cymatium (D) is the ſeventh part of the heighth of the epiſtylium, and in projecture it is the ſame. The remainder, excluſive of the cymatium, is divided into twelve parts; and of theſe, the firſt faſcia (A) has three, the ſecond (B) four, and the uppermoſt (C) five. The zophorus (o p) is a fourth part leſs than the epiſtylium which it reſts on; but

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(18*) Galiani, as well as Perault, obſerves, that, by this rule, in very high columns, the diminution being very ſmall, the projection of the epiſtylium (or architrave) would of courſe be too little, and therefore they ſuppoſe, that by the top of the epiſtylium ſhould be underſtood the top of its upper faſcia, excluding the cymatium. But, ſuppoſing this ſhould be the caſe, it ſtill conforms to the ſame principle of making the projectures leſs as the heighths are greater, and only transfers the rule from the top of the cymatium to the top of the upper faſcia. If this principle therefore is allowed in one part, it muſt be in another; and if it is practiſed in the faſcias, it ſhould be in the cymatium alſo. This, however, will not be the caſe in the cymatium, if we ſuppoſe it not to be included in the projecture here allowed to the epiſtylium; for, as the higher the columns are, the higher is the epiſtylium, and as the cymatium has in heighth and projecture the ſeventh part of the heighth of the epiſtylium, conſequently the projecture of the cymatium will be greater the higher the columns are, at the ſame time that the projecture of the faſcias will be leſs. This is ſo inconſiſtent, that I cannot help believing that Vitruvius certainly includes the cymatium in the projecture he allows to the epiſtylium, the rather, becauſe it is evident, that he includes the cymatium by the word epiſtylium, where he mentions its heighth, (for he ſpeaks juſt below of the remainder of the heighth of the epiſtylium, when the heighth of the cymatium is taken from it): and therefore there can be no doubt but that he includes the cymatium by the word epiſtylium, where he ſpeaks of its breadth; conſequently the top of the epiſtylium muſt mean the top of the cymatium of the epiſtylium. This argument is alſo ſtrengthened by the example of the temple of Fortuna Virilis at Rome; the projection of the cymatium conforms to the rule here given, the extremity of the cymatium being perpendicular to the bottom of the ſhaft of the column.

Nor can I think this a bad rule, or foreign to the intention of Vitruvius: for he ſays, altitudinal ſpaces are diminiſhed in appearance at great heighths, and therefore they ſhould be proportionally encreaſed; and for this very reaſon projectures in ſuch ſituations ſhould be proportionally leſſened, that they may not contribute to make the altitudinal ſpaces appear leſs; for a ſmall projecture at a great heighth, or a near view, obſtructs the ſight of a great altitudinal ſpace above it; and therefore the projecture of the epiſtylium on very high columns ought to be ſmall, in order to hide as little as poſſible of the incumbent friſe.

Theſe arguments alſo help to confirm the opinion concerning the projecture of the abacus, mentioned at note 16, foregoing, and to prove that Vitruvius does not here mean that its projecture ſhould be proportionally larger in higher columns, as all the tranſlators have rendered it, but the contrary; for the projecture of the abacus has the ſame influence on the members above it, as that of the epiſtylium has, and it is therefore moſt likely that Vitruvius would adviſe the ſame method to be obſerved in both caſes, not the direct contrary.

I am therefore of opinion that Vitruvius intends the heighth only of the epiſtylium to be altered by the variation of the heighth of the columns, and that all its projectures are to remain the ſame in all caſes, *(i. e.)* its top is to be always perpendicular with the bottom of the column.

I have given draughts of the epiſtylium according to the loweſt and higheſt proportion here mentioned. The former agrees with that of Fortuna Virilis; the latter is not quite ſo high as that of the theatre of Marcellus, which is three quarters of a diameter, whereas this amounts only to two thirds of a diameter and the twenty-fourth part; I have drawn it only two thirds, as being a proportion more conſentaneous to the other members. See Fig. XXIV. No. 3, 4, and 5.

(19*) The zophorus is that member which we call the *friſe*, o p, fig. XXIV. Vitruvius does not inform us whether or not the cymatium of the zophorus is included in the meaſure he allows to its heighth. I have repreſented it not included; and, with the proportionally loweſt epiſtylium, I have joined the proportionally higheſt zophorus that Vitruvius deſcribes, and, with the higheſt epiſtylium the loweſt zophorus; by which means the epiſtylium and zophorus together riſe to the ſame heighth in both caſes; but the cornice of the latter

if it is intended to be ornamented, it ſhould be a fourth part higher than the epiſtylium, that the ſculpture may be conſpicuous; its cymatium (E) is the ſeventh part of its heighth; the projecture of the cymatium is equal to its thickneſs.

Upon the zophorus the denticulus (v), is formed equal in heighth to the middle faſcia of the epiſtylium, and its projecture is the ſame as its heighth. The interſection, which by the Greeks is called *metoche*, is ſo ordered, that the dentil has in front the half part of its heighth, and the void of the interſection is two thirds of the breadth of the front; its cymatium is the ſixth part of its heighth. The corona (q), with its cymatium, excluſive of the ſima (x), is equal in heighth to the middle faſcia of the epiſtylium. The projecture of the corona, together with the dentil, is made equal to the heighth from the zophorus[20*] to the top of the cymatium of the corona; and all moldings in general will have the beſt effect when their projectures are made equal to their heighths.

Fig. XXIV. No. 3.

The heighth of the tympanum (E) of the faſtigium is thus determined: The whole front of the corona, from the extremes of the cymatium, being divided into nine parts, one of thoſe parts makes the heighth of the middle point of the tympanum. Its ſurface is perpendicular with the lower faſcia of the epiſtylium, and with the hypotrachelium of the columns. The coronæ[21*], which lye upon the tympanum, are, excepting the ſimæ, diſpoſed like thoſe below. Over the coronæ are the ſimæ (x), which the Greeks call *epitithedas*; they are made an eighth part higher than the coronæ.

Fig. XVIII.

Fig. XXIV.

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becomes larger, on account of its being governed by the heighth of the epiſtylium. Likewiſe, in the former caſe, for the ſake of proportion and conformity to the antique, and alſo as the difference is very ſmall, I have drawn the zophorus higher than the epiſtylium a fourth part of itſelf, inſtead of a fourth part of the epiſtylium; ſo that, in one caſe, the epiſtylium has three and the zophorus four parts; and in the other, the epiſtylium has four, and the zophorus three parts, each part being one ſixth of a diameter. I have however made no variation in the reading from the words of the text.

But if, with the higheſt epiſtylium, (I mean ſuch as is directed for columns of thirty feet high) a friſe of the higheſt proportion preſcribed is adjoined, (*i. e.* one that is a fourth part higher than the epiſtylium) then the whole entablature becomes larger than in either of the former caſes, exceeding two diameters in heighth, as the draughts demonſtrate. So that Vitruvius is miſrepreſented by thoſe maſters, who give the proportions he allows to the ſmalleſt columns, as thoſe which are to be invariably applied to columns of all magnitudes, and in all ſituations; from which miſrepreſentation Vitruvius has been unjuſtly accuſed of littleneſs, and of not allowing a ſufficient magnitude to the entablature of this order.

(20*) This muſt be underſtood, from the top of the cymatium of the zophorus, to the end that it may conform to the rule immediately after given, *viz.* of making the projectures equal to the heighths.

(21*) The word coronæ is ſometimes uſed for the whole cornice, and ſometimes for that ſingle member generally called *corona* (q Fig. XXIV.) in which latter ſenſe I think it muſt be here underſtood; for it was the practice of the Greeks to have no other member than the corona and ſima to run up the declivity of the tympan: and it is agreeable to the principle Vitruvius mentions in the ſecond chapter of the fourth book. It being alſo ſaid, that *the ſima is to be an eighth part higher than the corona*, confirms the opinion; for it cannot be ſuppoſed that Vitruvius means the ſima to be an eighth part higher than the whole cornice, that being too extravagant to be admitted.

Fig. XVIII. THE acroteriæ[22*] (a c) at the angles are as high as the middle of the tympanum; and the middle one (b) is an eighth part higher than thoſe at the angles.

ALL the members which are above the capitals of the columns, *viz.* the epiſtylium, zophorus, coronæ, tympanum, faſtigium, and acroteriæ, are to incline forward in the front the twelfth part of their heighth; for, when we ſtand oppoſite to the front, two rays diverging from the eye, one to the bottom of the work, the other to the top, that which aſcends to the top will be the longeſt; the viſual lines, therefore, that extend to the upper members being the longeſt, make the faces of thoſe members appear to lean backward; ſo that, when they are inclined forward, as above written, they then ſeem to be perpendicular and upright.[23*]

Fig. XXIV. THE ſtrigæ[24*] (L) of the columns are in number twenty-four, and are ſo excavated, that a ſquare being applied to the hollow of the ſtrigæ, and turned round, the arms of the ſquare may touch the edges of the ſtriæ to the right and left, while the point paſſes round, and touches every part of the circumference.[25*] The thickneſs of the ſtriæ is made equal to the ſwell in the middle of the column, which may be found by the deſcription.[26*]

THE ſimæ, which are upon the flanks of the temple, are to have the ſculptures of lions heads; and firſt, thoſe which are perpendicular to the ſeveral columns are to be deſigned,

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(22*) The acroteriæ are the little pedeſtals placed on the pediment, or faſtigium, to bear the ſtatues. I agree with Galiani, that the word *medium*, in the text, muſt be underſtood to refer to the middle of the heighth of the tympanum, not to the middle of its length; for, in the latter caſe, the acroters would be uſeleſsly and prepoſterouſly high. I alſo judge they are meant to be on a level with the ſaid middle of the tympanum, and not to be as high as half the heighth of the tympanum in their own proper meaſure. See c in the elevations of Fig. XIV. to XXI.

Where the elevation is broad, and the tympan of courſe high, the heighth of the acroters, according to this rule, becomes apparently too great, as may be ſeen by the acroters (c) in the ſeveral elevations above mentioned; and as, by this means, their proportional magnitude encreaſes as the breadth of the front encreaſes, (which is unneceſſary, conſidering their uſe), the rule ſeems not to be eligible, without ſome limits be fixed where the proportion ſhould vary.

I ſubmit it to the public judgment whether it might not be a good rule, to make the acroters at the angles ſo high above the top of the cornice as is equal to the projection of the cornice, whatever it may be; for, by this rule, their heighth will always be ſufficient to prevent their being hid by the projection of the cornice, if viewed at a moderate diſtance; and never too much, whatever may be the breadth of the front or the temple. I however would exclude the Tuſcan cornice, on account of its enormous projection.

(23*) In the theatre of Marcellus at Rome, the faſcias of the epiſtylium are inclined forward in the manner here directed. In caſes where the members are thus inclined, the projectures muſt ever remain the ſame, as if the members were perpendicular. This muſt undoubtedly be underſtood; for otherwiſe, the quantity of inclination in ſome parts being greater than the quantity of projecture, (as in the facias of the epiſtylium), the incumbent members in ſuch parts would appear to recede, inſtead of projecting.

(24*) Vitruvius uſes indifferently the words ſtrigæ and ſtriæ, to ſignify the flutings or channellings of the columns. Some ſuppoſe he uſes ſtriæ for the fillets or ſquares between the channels, as in this place he ſeems to do; but at the third chapter of the fourth book, he evidently applies the word ſtriæ to the channels only; for, at that place he is ſpeaking of the Doric channels, which have no fillets between them.

(25*) This is as much as to ſay, the channels are to be made ſemicircular; for the elbow of a ſquare revolving between two points, the two arms continuing all the while to touch both the ſaid points, deſcribes a ſemicircle.

(26*) The thickneſs of the fillets are about the thirtieth part of the diameter of the column. See note 11, at the ſecond chapter of this book.

the reſt are diſpoſed equidiſtantly, in ſuch a manner, that each may anſwer to the middle of each reſpective tile.[27*] Thoſe which are over the columns are to be perforated, for a channel to convey the rain-water from the tiles; but thoſe which are between are imperforate, that the water may be diſcharged from the tiles by the proper channels, and not fall in the intercolumns, nor overflow the paſſengers: ſo that the lions heads, which are over the columns, ſeem to diſgorge the water from their mouths. Thus I have, in this book, deſcribed, as well as I have been able, the conſtruction of Ionic temples. The proportions of the Doric and Corinthian kind I ſhall explain in the following book.

(27*) Perault thinks this ſhould not be underſtood each tyle, but *each water channel*, made in the roof; and Galiani thinks it ſhould be read *the middle channel*: but the text clearly enough expreſſes each tile, and I cannot ſee any abſurdity in ſuppoſing the ancient tyles were ſo large as to be equal to the diſtances between the lions heads; for in ſome parts of Italy, at this day, tiles of ſuch a magnitude are uſed as is equal to the diſtances that may be ſuppoſed to have been between the lions heads; and in the Tower of the Winds at Athens, this rule is fully exemplified, the middle of the tiles coinciding exactly with the middle of the lions heads in the ſima.

The breadth of the lower range of tiles in this tower is two feet eleven inches, though the diſtance from center to center of the heads is three feet ten inches, owing to the divergence of the radial lines. Suppoſing, however, two feet eleven inches, or even two feet ſix inches, or leſs, to have been the ſize of the ancient tyles, and conſequently the diſtances of the lions heads from each other, this meaſure will be ſufficiently large to admit us to ſuppoſe, that a head might have been placed oppoſite to each tyle; for, allowing only the number of two heads to happen in the intercolumns, (and leſs cannot be allowed, for Vitruvius ſpeaks of them in the plural) the centers of the columns may be ſeven, eight, or nine feet apart; which is a ſufficient and ample diſtance for moderately large temples of the pycnoſtyle or ſyſtyle kinds.

THE END OF THE THIRD BOOK.

THE

ARCHITECTURE

OF

M·VITRUVIUS·POLLIO.

BOOK THE FOURTH.

PROEM.

AS I have obſerved, O Emperor! many treatiſes of architecture, and books of commentaries, undertaken without method, and executed in ſuch a manner, as to omit various articles, I judged it proper and uſeful to reduce the ſubſtance of this work to a regular order, and, in the ſeveral books, to explain the nature of the ſeveral things herein written. I have therefore, O Cæſar! in the firſt book, explained to thee the qualifications of an architect, and the knowledge he ſhould poſſeſs. In the ſecond, I have diſcourſed on the materials of which buildings are conſtructed. And, in the third, of the compoſition of ſacred edifices, of their various kinds and ſpecies, and of their diſtribution according to their ſeveral kinds. Of the three orders which have preciſe modulary proportions, the Ionic I have already taught; in this book, therefore, I ſhall ſpeak of the Doric and Corinthian, and of their differences and properties.

CHAPTER I.

Of the three Kinds of Columns, and of their Invention.

CORINTHIAN columns, excepting in their capitals, have their ſymmetry the ſame as the Ionic; but the heighth of the capital renders them proportionally taller and more graceful; for the heighth of the Ionic capital is only a third part of the thickneſs of the column (1*); whereas that of the Corinthian is the whole thickneſs of the ſhaft: wherefore, as two thirds of the thickneſs of the column are added to the capitals of Corinthian columns, it cauſes them to appear higher and more graceful. The other members which are placed above the columns, are taken from the Doric or Ionic orders, and diſpoſed over Corinthian columns: for the Corinthian has no cornice, or other ornaments peculiar to itſelf, but has either triglyphs, mutules in the cornice, and guttæ in the epiſtylium, as in the Doric manner; or elſe, according to the Ionic manner, the zophorus is ornamented, and dentils are diſpoſed in the cornice (2*). So that by theſe two orders, joined with a different capital, a third order is produced; for, from the formation of the three kinds of columns, ariſe the denominations, Doric, Ionic, and Corinthian; of which the moſt ancient and firſt invented is the Doric; for, when Dorus, the ſon of Hellenus and the nymph Opticos, reigned over all Achaia and Peloponneſus, the temple of Juno, in the ancient city of Argos, was erected, and this order happened to be uſed in the fane. The ſame order was alſo uſed in the other cities of Achaia, before the laws of its ſymmetry were eſtabliſhed. *Fig. XXIII.*

AFTERWARD, when the Athenians, according to the reſponſes of Apollo of Delphos, and the common conſent of all Greece, tranſplanted, at one time, thirteen colonies into Aſia, appointing to every colony a leader, they gave the chief command to Ion, the ſon of Xuthus and Creuſa, whom alſo the Delphian Apollo acknowledged for his ſon. Theſe colonies he conducted to Aſia, ſeized on the territory of Caria, and there founded many large cities, as, Epheſus, Miletus, Myunta, (which laſt was formerly overflown with water, and its rites and privileges, by Ion, transferred to the Mileſians) Priene, Samos, Teos, Colophon, Chios, Erythræ, Phocis, Clazomenæ, Lebedus, and Melite. This latter, on account of the arrogance

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(1*) Reckoning from the top of the abacus to the bottom of the echinus, not to the bottom of the volute. Vitruvius therefore allows the Corinthian ſhaft to be of the ſame heighth as the Ionic ſhaft, and the whole column, including baſe and capital, two thirds of a diameter higher than the Ionic; that is, nine diameters and a ſixth.

(2*) This accounts for the differences found in the antique examples of the Corinthian order, which the ancients deemed a compound order.

of the citizens, was deſtroyed in the war declared againſt it, by the unanimous determination of the other cities, and, in its place, by the favour of King Attalus and Arſinoe, the city of Smyrna was received amongſt the Ionians. When theſe cities extirpated the Carians and Leleges, they, from their leader Ion, called that territory *Ionia*.

THERE they began to erect fanes, and conſtitute temples to the immortal Gods. Firſt, they erected the temple of Apollo Panionios, in the manner they had ſeen it in Achaia; which manner they called *Doric*, becauſe they had ſeen it firſt uſed in the Dorian cities. In this temple they were deſirous of uſing columns; but being ignorant of their ſymmetry, and of the proportions neceſſary to enable them to ſuſtain the weight, and give them an handſome appearance, they meaſured the human foot, and finding the foot of a man to be the ſixth part of his heighth, they gave that proportion to their columns, making the thickneſs of the ſhaft at the baſe equal to the ſixth part of the heighth, including the capital. Thus the Doric column, having the proportion, firmneſs, and beauty of the human body, firſt began to be uſed in buildings.

AFTERWARD, to conſtruct the temple of Diana, they ſought a new order from the ſame traces, copying the gracefulneſs of women, and making the thickneſs of the columns an eighth part of their heighth, in order to give them a taller appearance. The folds of the baſe they deſigned for the ſhoe; the volutes of the capital for the treſſes of hair, dropping to the right and left; the cymatium and encarpi[3*], for the locks diſpoſed to ornament the forehead; and the channels of the ſhaft for the plaits of the matrons garments. Thus aroſe the invention of theſe two different orders; one of a maſculine appearance, naked and unadorned; the other imitating the ſlenderneſs and fine proportion of women. But poſterity, improving in ingenuity and judgment, and delighting in more graceful proportions, fixed the heighth of Doric columns at ſeven times their diameter; and of the Ionic, at eight and a half. This latter order was called Ionic, becauſe it was firſt uſed by Ion.

THE third, which is called *Corinthian*, is in imitation of the delicacy of virgins; for, in that tender age, the limbs are formed more ſlender, and are more graceful in attire. The capital is reported to have been thus invented: A Corinthian maid, juſt marriageable, being ſeized with a diſorder, died: after her interment, her nurſe collected, and diſpoſed in a baſket, the toys which pleaſed her when alive, carried it to the tomb, placed it on the top, and, that it might endure the longer in the open air, covered it with a tyle. The baſket chanced to be placed over the root of an acanthus, which, being thus depreſſed in the middle, the leaves and ſtalks, in the ſpring ſeaſon, iſſued outward, and grew round the ſides

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(3*) Encarpi alludes to ſome ornaments in the Ionic capital; but which it preciſely means is doubtful; ſome take it for the feſtoons hanging from the eyes of the volutes; others for the pods, which ſpring from the volutes, and cover the angles between them and the ovolo; and others again for the foliage in the channel under the abacus. It may alſo mean the carving of the abacus, or flower in the middle of the ſame, as moſt reſembling the locks on the forehead.

of the baſket; and, being preſſed by the weight at the angles of the tyle, were made to convolve at the extremities, like volutes. At that time Callimachus, who, for his ingenuity and excellence in the arts, was, by the Athenians, named *Catatechnos*,* happening to paſs by this tomb, took notice of the baſket, and being pleaſed with the delicacy of the foliage growing around it, as well as the novelty of the form, made ſome columns near Corinth, according to this model, and from thence eſtabliſhed the ſymmetry, and determined the proportions of the Corinthian order.

Fig. XXIII. The ſymmetry of this capital is thus performed. The heighth of the capital (a c), including the abacus, is to be equal to the thickneſs of the column at bottom. The breadth of the abacus is ſo regulated, that its diagonal, from angle to angle (d d), may be twice as much as the heighth of the capital; for this gives a proper dimenſion to each face. The fronts of the abacus are bowed inwardly (g i), from the extreme angles (d f), a ninth part of its breadth.* The bottom of the capital is as thick as the top of the column (h), without the apotheſis (n) and aſtragal (o).** The thickneſs (a m) of the abacus is the ſeventh part of the heighth of the capital. The remainder, when the thickneſs of the abacus is deducted, is divided into three parts, of which one is given to the lower leaves; the ſecond is for the heighth of the middle leaves, and to the caulicules or ſtalks, from which leaves project, ſo as to ſupport the abacus, the ſame heighth is given. From theſe caulicules the volutes ſpring, projecting to the extreme angles; and the leſſer helices (k) are wrought under the flowers, which are in the middle of the fronts of the abacus. The flowers on the four ſides, are, in ſize, equal to the thickneſs of the abacus. Thus the Corinthian capital will have its proper ſymmetry.

There are alſo other kinds of capitals, called by various names, which are diſpoſed on the ſame columns, and which have no proper ſymmetry, or relation to any order of columns that can be named differently; but they are all derived and transferred from the Corinthian, pulvinated, or Doric orders, from whoſe ſymmetries they differ only in the little novelties of the ſculpture.

(4*) Catatechnos, the firſt of artiſts.

(5*) Vitruvius ſays nothing of obtunding or cutting off the corners of the abacus, as generally practiſed by the ancients as well as moderns: from whence we are led to believe, that the ſides of the abacus of the Corinthian capital, according to Vitruvius, ſhould terminate in four acute angles, as (d d) Fig. XXIII. Of this kind are the capitals of the Temple of Veſta, at Rome, and thoſe of the Poikile, or Stoa, at Athens.

(6*) Apotheſis is the ſmall ſquare, or fillet, under the aſtragal at the top of the column; at the ſeventh chapter of this book it is called apophygis.

CHAPTER II.

Of the Ornaments of Columns.

AS the origin and invention of the ſeveral orders of columns are above deſcribed, it ſeems to me not improper to ſpeak alſo of the origin of their ornaments,* and of the principles from which they were derived.

Fig. XXVIII. IN the upper part of all edifices, timbers, called by various names, are diſpoſed, which, as in names, ſo in uſes, differ. The trabs (e) are thoſe laid over the columns, paraſtatæ, and antæ, in the contignations and floors. If the ſpan of the roof is great, under the culmen (m), in the top of the faſtigium, are diſpoſed columens (a), from whence columns derive their name, tranſtræ (b), and capreols (d); but if the ſpan is ſmall, columens and canthers (c), projecting to the extremities of the eaves. Above the canthers are the templats (f); and over them, but under the tyles, are the aſſers (g), projecting ſo far as to ſhelter the walls. Thus each, according to its uſe, has its proper place and order.

(o*) By the word ornaments is to be underſtood entablatures, Vitruvius expreſſing them by that appellation.

(1*) I have adhered to the Latin names of the timbers, in order to preſerve a ſimilarity between the reading of the text and of the tranſlation, and to give the reader a better opportunity of making his own judgment of the timbers meant by thoſe names, mentioning my own opinion thereon in the notes.

The trabes, or beams, are undoubtedly the plates, or raiſing plates, as our workmen call them; being the timbers that are laid upon the ſummit of the walls, columns, &c. receiving the preſſure of the roof, and diſtributing it equably over the ſupports. From this timber, the architrave, or epiſtylium, is derived, e e Fig. XXVIII.

The column, or columen, I conceive to be that upright piece (a a), by us called king-poſt, which is ſituated perpendicularly under the ridge of the roof, deſcending from thence to the tigna h, or croſs beam, below. Some have taken it for the horizontal piece in the ridge, called the ridge piece, (m m) and which, Vitruvius, in this place, as well as in the firſt chapter of the fifth book, calls culmen.

The name of columns, being derived therefrom, is a circumſtance that favours the ſuppoſition of its being a perpendicular piece; and the king-poſt, which is a principal and neceſſary part of a large roof, and the mention of which is to be expected, in a deſcription of the timbers of a roof, is no where elſe mentioned.

The tranſtræ I was about to accept, as others have done, for the horizontal beams, h h that lay croſs the building, holding together the oppoſite walls, when I obſerved that thoſe croſs beams are mentioned in the next paragraph by the general name of tignæ: and it is ſaid that the tranſtræ are uſed in large roofs only, not in ſmall. Alſo in the deſcription of the Baſilica of Fano (Chap. I. Book V.) Vitruvius mentions tranſtræ ſupporting the culmen, where it is evident no ſuch horizontal beams can be uſed, on account of the vault of the cieling riſing into the angle of the roof; and where thoſe who have ſuppoſed the tranſtræ to be the horizontal beams have repreſented no ſuch beams; and conſequently no tranſtræ, although Vitruvius expreſsly mentions them. From theſe circumſtances, I judge the tranſtræ to be the principal rafters (b b); for thoſe rafters, and the braces, or capreols (d) as well as the king-poſt (a) are (as Vitruvius ſays) uſed only in large roofs, not in ſmall; and are neceſſary, not only on account of the magnitude of the roof, but on account of the projecture of the ſmall rafters beyond the ends of the tignæ (in the ſame manner as the mutules project beyond the triglyphs;) and which could not happen without the aſſiſtance of ſuch principal rafters to ſupport them I do not ſuppoſe theſe tranſtræ, or principal rafters, to have been uſed at every tigna, but at proper diſtances.

The capreols are univerſally allowed to be the ſtruts, or braces (d d.)

The canthers are evidently the common rafters (c c); for Vitruvius ſays, the declination of the mutules are in imitation of the inclined poſition of the canthers. I have purpoſely avoided drawing the canthers ſo broad in proportion as the mutules are generally repreſented.

The templats are the croſs pieces (f f) ſerving to ſupport the aſſers in the ſpaces between the canthers.

The aſſers ſeem to be ſmall pieces ranged very cloſe, in order to ſupport the tiles; for Vitruvius ſays, they laid between the templats and the tiles; and the dentils are in imitation thereof.

This diſpoſition of the work, the artificers, when they erected ſacred edifices, imitated in ſculptures of ſtone and marble; and this invention the ancient workmen thought proper to purſue. Thus, whenever they conſtructed any building, they laid the joiſts from the interior walls to the extreme parts, then built up the interjoiſt (k), and, to give the work a pleaſing appearance, adorned the top with a cornice and faſtigium; then, as much of the joiſts as projected beyond the wall they ſawed off; which appearing unhandſome, they made tablets (h), like the triglyphs now in uſe, fixed them againſt the ſawed ends of the joiſts, and painted them in wax, that the ſections of the joiſts might not offend the ſight. Thus the triglyphs, interjoiſts, and opæ*, in Doric work, had their origin from the diſpoſition of the timbers of the roof.

Afterward, in other works, ſome made the canthers, that were perpendicularly over the triglyphs, to project outward, and carved their projecture; hence, as the triglyphs aroſe from the diſpoſition of the joiſts, ſo the mutules under the corona were derived from the projecture of the canthers: wherefore, in ſtone or marble ſtructures, the mutules are repreſented declining, in imitation of the canthers; and alſo, on account of the droppings from the eaves, it is proper they ſhould have ſuch declination.

From this imitation, therefore, aroſe the uſe of triglyphs and mutules in Doric work: for it cannot be, as ſome erroneouſly aſſert, that the triglyphs repreſent windows; becauſe triglyphs are diſpoſed in the angles*, and over the quarters* of the columns, in which places windows are not permitted; for if windows were there left, the union of the angles of buildings would be diſſolved; alſo, if the triglyphs are ſuppoſed to be ſituated in the place of the windows, by the ſame reaſon, the dentils in Ionic work may be thought to occupy the places of the windows; for the intervals between the dentils, as well as between the triglyphs, are called *metopæ*; the Greeks calling the bed of the joiſts and aſſers, *opas*, (as we call it *cava*, *columbaria*); ſo becauſe the interjoiſt is between two opæ, it is by them called *met-opæ*. As the triglyphs and mutules in the Doric order are founded upon theſe principles, ſo the dentils, in the Ionic, derive their proper origin from the workmanſhip; and as the mutules repreſent the projectures of the canthers, the dentils in the Ionic order are in imitation of the projecture of the aſſers. For this reaſon, in Grecian buildings, dentils are never placed under the mutules; for aſſers cannot be under canthers. As therefore they ſhould in reality be above the canthers and templats, if they are repreſented below them, the work is on falſe principles. The ancients likewiſe did not approve of placing mutules or dentils in the faſtigium, but the

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(2*) Opæ is explained farther on in this chapter.

(3*) In the ruins of the Grecian buildings at Athens, and alſo in ſome at Peſtum, in Italy, we find the triglyphs placed cloſe to the angles, not perpendicularly over the middle of the columns, as practiſed in the Roman as well as modern architecture.

(4*) By this expreſſion we are to underſtand the middle of the columns; for the quarters of the columns, I ſuppoſe, mean the four parts of the column, when divided on the plan, by two diagonal lines paſſing through the center at right angles to each other, in the form of a croſs, thus,  . In the next chapter Vitruvius calls them the middle quarters, which are the two quarters a and d in the middle of the front and rear of a column ſo divided, having the two other quarters b and c on either ſide them.

corona only; becauſe, neither canthers nor aſſers are laid toward the front of the faſtigium; nor can they there project, for they are laid inclining toward the eaves. As, therefore, it could not be done in reality, they judged it not proper to be done in repreſentation; for the propriety of all things; which they introduced in works of perfection, they derived from truth and nature; and approved thoſe only which could bear the teſt of rational argumentation. From theſe principles they eſtabliſhed the ſymmetry and proportions of each order; of which, purſuing the deſcription, and having ſpoken above of the inſtitution of the Ionic and the Corinthian; I ſhall now briefly explain the proportion and formation of the Doric.

CHAPTER III.

Of the Doric Order.

SOME architects have maintained, that temples ſhould not be built of the Doric order, becauſe it occaſions an imperfection and an inconvenience in the ſymmetry; for this reaſon it was rejected by Tarcheſius, Pytheus, and alſo by Hermogenes: the latter, after he had prepared marble materials for a Doric temple, altered them, and from the ſame materials raiſed an Ionic temple to Bacchus. However, it was not becauſe the appearance was unhandſome, or the manner or form ignoble; but becauſe it impeded the diſtribution, and the arrangement of the triglyphs and lacunars[1*] was unſuitable to the deſign; for it is neceſſary that the triglyphs ſhould be diſpoſed over the middle quarters of the columns; the metops, which are between the triglyphs, be made as long as high; and the triglyphs over the angle columns be placed at the extremities, and not over the middle quarters. So that the metops which adjoin the angular triglyphs, are not ſquare, but more oblong by half the breadth of a triglyph.[2*] Thoſe who would make all the metops equal, contract the extreme intercolumn

(1*) The lacunars are the coffers or pannels uſually formed in the ſoffites of the corona, or architrave, as well as in the cielings, &c.

(2*) Galiani, as well as Perault, remarks, that the metop is not encreaſed quite half the breadth of a triglyph, but leſs than half, by as much as the ſemi-diminution of the column. This is not the fact; they have not recollected the lateral projection of the triglyph from the face of the friſe, but have ſuppoſed the outer edge of the angular triglyph to be perpendicular with the top of the ſhaft of the column; whereas, according to the rule of Vitruvius here given, the ſaid outer edge will ever be perpendicular to the bottom of the ſhaft, which was the conſtant practice of the Greeks; ſo that the extreme metop was encreaſed half the breadth of a triglyph exactly, and the projection of the triglyphs was the only thing varied by the various diminution of the columns.

The projection of the triglyphs will by this rule be leſs, in proportion as the column is taller, and leſs diminiſhed; which is agreeable to the remark made at the third chapter of the third book.

The method of placing the outer edge of the angular triglyphs perpendicular to the bottom of the ſhaft of the column, was generally practiſed by the Greeks, as is proved by all the examples of Grecian temples now remaining; but they made the face of the epiſtylium alſo in the ſame perpendicular; whereas Vitruvius directs this latter to be perpendicular to the top of the ſhaft, and, (as may be inferred from the context) the face of the friſe or metop alſo. See note 4* enſuing.

half the breadth of a triglyph; but this, whether it is done by lengthening the metop, or by contracting the intercolumn, is a defect. On this account, the ancients avoided the uſe of the Doric order in ſacred edifices. Following however our method, we ſhall give the explanation of this order, as we have received it from the maſters; ſo that thoſe who attend to theſe precepts will here find deſcribed the rules by which they may erect a temple in the Doric manner, without fault or imperfection.

Fig. XIV. and XV. The front of the Doric temple, where the columns are erected, is, if tetraſtyle, divided into XXVIII parts; if hexaſtyle into XLIV.[3*] Of theſe parts one will be a module, called in Greek *embates*, by which the diſtribution of the whole work

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(3*) The numbers 28 and 44, which are found in the manuſcripts, have been altered by all the tranſlators to 27 and 42; they ſuppoſing the former two numbers to have been erroneous, and to have ariſen from the miſtake of the copyiſts; becauſe, upon computing the number and meaſure of triglyphs and metops afterwards deſcribed in the front, the latter numbers are produced.

Their manner of computation is as follows: In the tetraſtyle temple is 11 triglyphs, at one module each, and 10 metops at a module and a half each; which together make 26 modules; and that, added to half a module at either end, amounts in all to 27 modules.

In the hexaſtyle temple is 17 triglyphs and 16 metops; which, according to the meaſures abovementioned, make 41 modules, and 1 module being added for the ſemi-metops at the angles, it amounts in the whole to 42 modules.

But, upon reflecting on the facility of the computation, the general agreement of the copies, and the improbability of ſo evident an error being generally and uniformly continued, I was induced to ſuſpect, that the ſource of this diſagreement lay in ſome other miſt.

Purſuing this thought, and obſerving that Vitruvius (a little farther) ſays, this diſpoſition is for diaſtyle work, I tried the computation according to that ſpecies of intercolumniation, and found it exactly agreed therewith; the numbers, as generally wrote in the text, happening right in both inſtances. Thus, in the tetraſtyle temple, the two lateral intercolumns, at 3 diameters, or 6 modules each, is 12 modules; the middle intercolumn to contain three triglyphs muſt be 8 modules; and the four columns, at 2 modules each, is 8 modules; which altogether make 28 modules, the number of the text. So, in the hexaſtyle temple, the four lateral intercolumns, at 6 modules each, is 24 modules; the middle one 8, and the ſix columns 12; which in all make 44 modules, as in the text. But, in this caſe it will happen that the metops in the lateral intercolumns will be a ſixth part of a module longer than a module and a half, the meaſure generally allowed them; and, on the other hand, if the metops are computed no more than a module and an half, the lateral intercolumns will be half a module leſs than three diameters, the juſt meaſure of diaſtyle work. It may be ſaid, that the deduction of half a module does not change the ſpecies of intercolumniation; but I anſwer half a module changes euſtyle to ſyſtyle; and, if a ſmall difference from the preſcribed meaſure may be allowed in the intercolumns, it may alſo, with as little impropriety, be allowed in the metops.

The differences in the proportion of the metops that may be obſerved in the ſeveral Grecian ruins, in thoſe at Pœſtum, and in other remains of antiquity, make it appear, that the ancients did not ſcrupulouſly adhere to the rule of giving the metops a module and a half preciſely, or to making them exactly ſquare.

In a Doric temple, at Cora in Italy, publiſhed by Piraneſi, the metops of the ſide and middle intercolumns are not of the ſame breadth; alſo, in ſome ancient examples, the capital of the triglyphs is included in the module and half, and in others it is excluded; it is ſometimes continued through the metop, and ſometimes diſcontinued.

Nor does Vitruvius poſitively fix the heighth of the metops, but only ſays, they are as high as long. The heighth of the triglyphs did not always determine that of the metops, which ſometimes roſe higher than the triglyphs, breaking into the capital or large band above them.

In the preſent caſe, the extraordinary length of the metop is exactly equal to the heighth of the capital of the triglyph (each being the ſixth part of a module), ſo that ſuppoſing that member to be included in the heighth of the metops, they perfectly agree with the words of Vitruvius, in being exactly as long as high.

The agreement, therefore, of the numbers of the text, with the ſpecies of intercolumniation mentioned, makes it highly probable that Vitruvius intended the metops to be of ſuch a length, diſregarding the ſmall differences in their meaſures, as not being conſiderable enough to offend the eye; and that conſequently the numbers, as generally found in the manuſcripts, are perfectly right, and as intended by the author.

is regulated. The thickneſs of the columns is two modules; the heighth, including the capitals, fourteen. The thickneſs of the capital (a c) one module; the breadth (a b), two and the ſixth part of a module. The thickneſs of the capital is divided into three parts, of which one is for the abacus (d) with its cymatium; another for the echinus (f) with its annules; and the third for the hypotrachelion (h.) The columns are diminiſhed in the ſame manner as deſcribed for Ionic columns in the third book.

Fig. XXVI.

THE heighth of the epiſtilium (e) with the tenia (g) and guttæ (i) is one module. The tenia is the ſeventh part of a module. The length of the guttæ, under the tenia, coincides with the perpendicular of the triglyphs. Their heighth, with the regula; (k) is the ſixth part of a module. The breadth of the bottom of the epiſtylium anſwers to the hypotrachelion at the top of the columns.

UPON the epiſtylium; the triglyphs (ll), having the metops (m) between them; are placed; being one module and a half high, and one module broad in front; they are ſo diſtributed, that thoſe which happen over the angle, as well as over the intermediate columns, may be perpendicular to the middle quarters thereof; two are left in the intercolumns; and in the middle intercolumn of the pronaos and of the poſticus, three; for, by this enlargment of the middle interval, the approach to the image of God is rendered more commodious and free from impediment.

THE breadth of the triglyph is divided into ſix parts; of which, five are placed in the middle, two and a half being on either ſide. The middle one makes the regula or femur (n), which the Greeks call *meros*. On either ſide this, are the channels; ſunk as if imprinted with the elbow of a ſquare. To the right and left of theſe, another femur is formed, and at the extremities ſemi-channels are ſlanted.

THE triglyphs being thus diſpoſed, the metops, which are between the triglyphs, are as high as long. At the extreme angles, ſemi metops are impreſſed, half a module broad. 4*

(4*) It is to be remembered that Vitruvius makes his diviſions on the line whereon the columns are erected, and includes in the extent of that line the whole ſhaft of the angle columns; when, therefore, all the triglyphs and metops are adjuſted according to the directions given, at either end of that line will remain a ſpace equal to half a module. This is the meaning of Vitruvius, and not that the ſpace left at the angles at the heighth of the friſe will be half a module, as it has been uſually underſtood by the tranſlators; for, on account of the diminution of the ſhaft of the columns, the ſpace at that height will be leſſened.

Vitruvius has given us no information concerning the projection of the triglyphs from the face of the metops. In the Greek works, the face of the triglyph is always found to be perpendicular with the face of the epiſtylium, and the metop recedes; but in the Roman works, as in the theatre of Marcellus, and the Doric temple of Cora, the faces of the metops are perpendicular with the face of the epiſtylium, and the triglyphs project. For want of inſtruction, therefore, with regard to the quantity of the triglyphs projection, I ſhall follow the example of the theatre of Marcellus, in which it is nearly equal to the twentieth part of the diameter of the column.

Thus the metops, intercolumns, and lacunars, being regularly diſtributed, all defects will be avoided. The capital (p) of the triglyph is made the ſixth part of a module.[5*]

Over the capital of the triglyphs is placed the corona (q), projecting the half and the ſixth part of a module,[6*] having a Doric cymatium[7*] (v) below, and another (v) above. The thickneſs of the corona, with the cymatiums, is half a module.[8*] In the under part of the corona, perpendicular to the triglyphs, and to the middle of the metops,[9*] the directions of the viæ[10*] (z), and the diſtribution of the guttæ (i), are to be ſo contrived, that there may be ſix guttæ in length, and three in breadth. The remaining ſpaces (y), the metops being broader than the triglyphs, are left plain, or have the ſculptures of thunder-bolts. Near the edge of the ſame corona, a line is enchaſed, which is called *ſcotia*[11*] (A). The tympan, ſima, coronæ, and the reſt, are executed in the ſame manner as has been deſcribed for the Ionic order.

Fig. XVII. The foregoing is the method for compoſing diaſtyle works; but, if the ſtructure is to be made ſyſtyle and monotriglyph,[12*] the front of the temple, if tetraſtyle, is divided into XXIII parts; if hexaſtyle, into XXXV. Of theſe one part will be a

(5*) Whether the capital of the triglyphs is included or excluded from the module and half, allowed to their heighth, Vitruvius leaves uncertain; neither will the ancient examples help to determine it; ſome having it included, and others excluded.

(6*) Vitruvius does not inform us whether or not this projection of the corona is exclusive of the projection of the cymatiums; but judging from the examples of antiquity, and the ſpace the guttæ in the ſoffite require, I think it ſhould be underſtood to be exclusive. The projecture of the corona in the theatre of Marcellus is much greater.

(7*) Cymatium, in a general ſenſe, ſignifies a ſubordinate moulding of any ſhape that relates to one of the principal members; what particular moulding is meant by the Doric Cymatium is not known.

(8*) Galiani has juſt before reproved Perault for having deviated from the text, by altering the projection of the Doric capital; and here (ſo unfortunate we are) has himſelf fallen into a ſimilar error, having in his tranſlation taken the liberty to add a ſixth part of a module to the half module, which the text allows to the thickneſs of the corona; giving for reaſon, the general rule preſcribed by Vitruvius, that the heights ſhould be equal to the projectures; and his own opinion, that the cornice wants that increment. But theſe are not ſufficient reaſons for deviating from the expreſs direction of the text twice repeated; and (turning his own argument againſt himſelf) as the projecture preſcribed by the text, is not impracticable. Therefore, although I have a due value for his opinion in general, I think it not proper in this caſe to follow his example.

(9*) Vitruvius directs mutules to be made over the metops as well as over the triglyphs. This is ſo contrary to the cuſtom of the moderns, that none of the preceding tranſlators have underſtood the paſſage; not believing it could poſſibly have that meaning: but ſince the remains of the Grecian buildings have become known to us, we are no longer doubtful of its being the author's intention that mutules ſhould be made over the metops as well as over the triglyphs, (as fig. XXVI. ſhews.) This alſo clears the ſucceeding paſſage, *reliqua ſpatia quæ latiores ſunt metopæ quam triglyphi*, which has much puzzled the commentators, and which they have all underſtood and explained, by their draughts, in a manner different to each other.

(10*) The Viæ, I conceive to be the intervals or ſpaces between the guttæ; and that they are ſo called becauſe they reſemble the viæ, or ſtreets, about the iſlands of houſes in a city. Galiani ſuppoſes them to be the margins of the pannels in the ſoffite of the corona.

(11*) This is a groove made to check the rain water.

(12*) Monotriglyph ſignifies that manner which has only one triglyph in the intercolumns.

If the metops are allowed to be no more than a module and a half broad, the intercolumns can be no more than a diameter and half wide. Wherefore, it has been generally ſuppoſed that *ſyſtylos* has been wrote, by miſtake, inſtead of *pycnoſtylos*, to which Galiani has altered the text. This point will be diſcuſſed in the following notes.

module; by which the work is to be regulated as before written. Then over every epistylium,[13*] two metops and triglyphs[14*] are disposed. In the angles this (species) is larger (than the former) by as much as the space of the bisected hemitriglyph.[15*] So that there happens in the middle epistylium, under the fastigium, the space of three triglyphs and three metops,[16*] for the

(13*) It has been before observed, that Vitruvius, in some places, considers each stone of the entablature that lays from center to center of column as a separate epistylium; as d e and e f, Fig. XVI.

(14*) This passage has been generally misunderstood and miscorrected, by the editors and translators, to two metops and one triglyph. De Laet and Galiani, following the correction of Philander, have thus given the text, *metopæ duæ & triglyphi singuli*, instead of *metopæ & trigliphi bini*, as the manuscripts express it.

It must be noted, that in describing this monotriglyph work, Vitruvius does not previously mention the triglyphs over the columns, as he has done in the description of the diastyle work. It is therefore necessary that he should, by some means, mention and include them, as well as those over the intercolumns. This he does, by describing two metops and two triglyphs over each epistylium; for from center to center of column is two metops, one whole triglyph and two hemitriglyphs, which make two of each. Those who read but one triglyph suppose no mention to be made in the text of those over the columns; which are, however, necessary to complete the number of modules which they themselves assign to the front of the temple.

(15*) Here is another erroneous alteration of the text, derived from the mistaken correction of Philander, and adopted by all the other editors. They read, *in angularibus non amplius quam quantum est spatium hemitriglyphi*, instead of *in angularibus, hoc amplius quantum dimidiatum, est spatium hemitriglyphi*, which I find in four manuscripts: and Philander has given it as the current text. This latter reading is perfectly just; for, as the manner of numbering the triglyphs and metops in this systyle work, is from center to center of column, there must consequently be a hemitriglyph left unaccounted over the angle columns; by which it happens that the space to be added at the angles is larger than in the former case, (that is, than in the diastyle work) by as much as that bisected hemitriglyph; and thus it it expressed by the latter reading: whereas the former reading, which is the false correction, expresses only, that a hemitriglyph is left at the angles; as in the former instance, which is a defective and erroneous explication; for there remains at the angles a hemitriglyph more than in the former instance.

But I find this whole passage so different from that in the common editions, that it may not be improper to transcribe it, *ita supra singula epistylia & metopæ & triglyphi bini erunt collocandi: in angularibus, hoc amplius, quantum dimidiatum est spatium hemitriglyphi, id accedat in mediano, habens cymatium Doricum in imo, alterum in summo, item cum cymatiis corona crassa ex dimidia, divideude autem sunt in corona ima ad perpendiculum contra fastigium trium triglyphorum & trium metoparum spatium distabit, quod latius medium intercolumnium accedentibus ad ædem habeat laxamentum & adversus simulacra Deorum aspectus dignitatem. Columnas autem stria, &c.* which runs thus in translation, Over every epistylium, metops, and triglyph two of each are disposed. In the angles this (species) is larger (than the former) by as much as the space of the bisected hemitriglyph; so that it happens, in the middle epistylium (the corona having a Doric cymatium below and another above, and being, with the cymatiums, half a module thick) that the space under the corona perpendicular to the fastigium, is divided into three triglyphs, and three metops; for the middle intercolumn being enlarged, renders the entrance of the temple more spacious, and gives an appearance of dignity towards the statue of the God.

(16*) Again; where the manuscripts have *trium triglyphorum & trium metoparum*, Philander would have *duorum triglyphorum & trium metoparum*, or *trium triglyphorum & quatur metoparum*; which last; De Laet; Barbaro, Perault and Galiani have adopted. But, as it has been before shewn that Vitruvius computes from center to center of column, the number of triglyphs and metops must of course be equal. Therefore, the original reading is more probably right; and we shall find, by the following observations, that it perfectly agrees with the other circumstances of the context.

I come now to speak of the other two numbers, viz XXIII and XXXV, which have been changed by some to *nineteen and a half*, and *twenty-nine and a half*, by others to *twenty-two* and *thirty-two*. I deferred speaking of these till after the preceding notes, that what is said thereon may be the better understood. Proceeding to prove these numbers in the same manner as the former two, I first premise that Vitruvius intitles this Systyle work; and, as he prescribes but one triglyph in each intercolumn, the metops are consequently two modules in breadth. Therefore, in the tetrastyle temple, the four columns and two latteral intercolumns make 8 diameters. The middle intercolumn, to contain the given number of triglyphs and metops of the same dimensions, will require to be $3\frac{1}{2}$ diameters; which, added to the former 8, make in all $11\frac{1}{2}$ diameters, or 23 modules, exactly the number mentioned by Vitruvius. It may also be computed by the number of triglyphs and metops: thus, eight triglyphs, at one module each, is 8 modules; seven metops, at two modules each, is 14 modules; which together make 22: and the two portions of metops,

enlargement of the middle intercolumn renders the entrance of the temple more ſpacious; and gives an appearance of dignity towards the ſtatue of the God.

Upon the capital of the triglyphs, the corona is to be placed, having, as before ſaid, a Doric cymatium at bottom and another at top. The thickneſs of the corona, with its cymatiums, is half a module. The under part of the corona, perpendicular to the triglyphs, and to the middle of the metops, is to be divided, for the direction of the viæ, and the diſtribution of the guttæ; all the reſt are the ſame as has been mentioned in the diaſtyle ſpecies.

Fig. XXVI. The columns are to be wrought in twenty ſtriæ,[17*] which, if made flat, form twenty angles, (3, 5, 7;) but, if they are hollowed, they are to be thus performed. A ſquare (1, 2, 3, 4) is deſcribed, whoſe ſides are equal to the interval of a ſtria; in the center (8) of the ſquare, the central point of the compaſſes is placed, and a circular line drawn, touching the angles of the ſquare; and that portion of the curve (2 3), which is between the lines of the circle and the ſquare, forms the hollow of the ſtria. Thus the Doric column will have its proper kind of ſtriature. With regard to the ſwelling which it has in the middle, it is the ſame as has been deſcribed in the third book for Ionic columns.

As the ſymmetry of the external parts of Corinthian, Doric, and Ionic temples, has been deſcribed, it is alſo neceſſary to explain the internal diſtribution of the cell and pronaos.

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left at the angles, is another module, amounting in all to 23 modules.

The ſame computation alſo anſwers in the hexaſtyle temple; there are twelve triglyphs, which is 12 modules; eleven metops, which is 22 modules; and the portions of metops left at the angles is 1 module, which make in all 35 modules, the number of the text.

The objection is, that the metops will be half a module broader than it is ſuppoſed they ſhould be; notwithſtanding which, the exact agreement of the numbers in theſe two, as well as in the former two inſtances, with the ſpecies of intercolumniation mentioned, is a ſufficient argument to prove, that, ſuch a breadth in the metops was intended by Vitruvius in monotriglyph and ſyſtyle work, as he terms it, and eſpecially with columns, whoſe thickneſs is the ſeventh part of their heighth; for we find, by the examples before mentioned, that the ancients did not ſcrupulouſly adhere to the rule of making the heighth and breadth of the metops equal; or of giving them exactly a module and an half in breadth.

Alſo, in the ſecond chapter of the third book, Vitruvius ſays, *Columns whoſe thickneſs is the eighth part of their heighth, would appear groſs and unhandſome if uſed in pycnoſtyle work*; much worſe, therefore, would theſe (whoſe thickneſs is the ſeventh part of their heighth) appear in his opinion, if they were ſo applied: as even the ſmall draft, Fig. XVI, evinces. All which contribute to confirm the opinion, that he never intended ſuch application; and the perfect agreement and aptneſs of all theſe circumſtances, ſeem ſufficient to aſſure us of the juſtneſs of the reading as generally found in the text.

Fig. XVII. ſhews the Doric monotriglyph front with ſyſtyle intercolumns, as deſcribed by Vitruvius; and Fig. XVI. the ſame, with pycnoſtyle intercolumns, as altered by former editors.

(17*)In the Doric temple at Cora, before mentioned, is an example of both theſe ſorts of ſtriæ or channelling; the lower part of the columns having the flat, and the upper part the hollow kind of ſtriæ. See Fig. XXVI.

CHAPTER IV.

Of the internal Diſtribution of the Cell and Pronaos.

Fig. XVIII. THE temple is to be ſo contrived, that the breadth may be half the length, and the ſame cell be in length (K C) a fourth part more than the breadth[2*], including the wall in which the doors are placed. The remaining three parts advance to the antæ (D) of the walls of the pronaos, which antæ ſhould be of the ſame thickneſs as the columns; and if the cell[3*] is more than XX feet in breadth, Fig. XVIII. two columns (1 2) are placed between the two antæ (D), which ſeparate the ſpace of the pteromatos[4*] and the pronaos. Alſo, the three intercolumns which are between the antæ (D) and columns (1 2), are cloſed with plutei[5*] of marble, or of inſide materials, leaving therein apertures to communicate with the pronaos.

(1*) It is proper to be mentioned, as a caution, that all the tranſlators before Galiani (who himſelf has made the remark) have ſuppoſed this chapter treated of a kind of temples different from thoſe before explained, and have made their draughts accordingly; whereas it is ſufficiently evident, by the reading of the context, that it treats of the internal parts of the ſame temples, of which the external only have been deſcribed.

(2*) I at firſt thought with Galiani, that the breadth here mentioned ſhould be underſtood to be that of the whole temple; but ſeveral concurring circumſtances obliged me to alter my opinion. Vitruvius ſpeaks of two columns (1 2, Fig. XVIII) to be placed between the antæ D, if the breadth exceeds twenty feet; and of two others (5 6) to be placed more inward, if the breadth exceeds forty feet. This neceſſarily ſuppoſes a conſiderable diſtance between the antæ D and the front walls C of the cell; but, if the length of the cell is a fourth part more than the breadth of the whole temple, no ſuch diſtance can happen, nor any ſuch columns be placed, as appears by Galiani's draughts, and as may eaſily be proved by trial on any of the draughts of temples. Fig. XVIII, XIX, and XX. But, if the breadth mentioned is underſtood to be that of the cell, then the parts happen ſuitable to this diſpoſition of columns, as is ſhewn by the plans of the peripteral temples above mentioned; which, therefore, is a ſufficient evidence that it ſhould be ſo underſtood.

This being the caſe, it follows, that the three parts mentioned to remain, and to extend to the antæ, muſt relate to the cell alſo; and, conſequently, that the word temple *(ædis)* at the beginning of the chapter, muſt be underſtood to ſignify the internal temple or cell only; that is, from the columns marked 1 2, to thoſe marked 3 4, excluding the periſtyle of columns around the ſame. The external proportion of the whole temple has been before deſcribed in the firſt chapter of the third book; and the uſe o this chapter is profeſſedly to explain the internal parts.

(3*) Here again the word *ædis* muſt be underſtood to mean the cell; becauſe the placing of columns, 1 2, Fig. XVIII, between the antæ D, muſt be ſuppoſed to depend on the diſtance of theſe antæ from each other, and on the breadth of the cell; alſo, becauſe, in peripteral temples (which are the temples in queſtion) a breadth of twenty feet in the whole would cauſe the cell to be too ſmall to require two columns to be placed in the breadth between the antæ thereof.

(4*) Pteromatos ſignifies the walks and ranges of columns on the flanks of the temple. See note 14, at the VIIth chapter of this book.

(5*) Plutei was the general name of all kinds of fences. To what heighth theſe plutei between the columns were raiſed we are not informed; but moſt probably they were only pedeſtal high. See note 3, chapter 1. book V.

Fig. XVIII. If the breadth is more than XL feet, columns (5 6) are placed more inward, oppoſite to the columns, between the antæ, and have the ſame heighth as thoſe in front; but their thickneſs is leſſened according to this rule; if thoſe in front are an eighth part of their heighth, theſe are made a ninth part; and if thoſe are a ninth or tenth, theſe are made proportional; for, on account of the incloſure of the air, this diminution will not be diſcerned; but if they ſhould appear thinner, the ſtriæ, being XXIV in the exterior columns, in theſe muſt be made XXVIII or XXXII, that what is taken from the ſubſtance of the ſhaft may be ſo retrieved by the additional number of ſtriæ as to be imperceptible: and thus columns of unequal thickneſs will be made to appear equal. The reaſon of this effect is, the eye ſeeing the objects more numerous and frequent, ſeems to paſs over a greater compaſs; for, if two columns of equal thickneſs are meaſured round with lines, one being ſtriated, the other not, and the line girts over the hollows and angles of the ſtriæ; notwithſtanding the columns may be of equal thickneſs, the lines which encompaſs them will not be equal, becauſe the girt of the ſtriæ renders one of the lines of a greater length. This being the caſe, it cannot be improper, in narrow and encloſed places, to make the ſymmetry of the columns more ſlender, provided we properly adjuſt the ſtriæ.

The thickneſs of the walls of the cell ſhould be in proportion to its magnitude, obſerving that the antæ are to be of equal thickneſs with the columns. If they are built with ſmall ſtones, they are to be regularly laid; but if ſquared ſtones or marble are uſed, they are generally formed rather ſmall and equal; becauſe the middle ſtones binding the middle joints, make the whole work ſtronger, and alſo the riſings, occaſioned by the preſſure about the joints and courſes, become more agreeable in appearance.

CHAPTER V.

Of the Poſition of Temples according to the Regions.

THE ſacred temples of the immortal Gods ſhould be ſo diſpoſed, that, if there is no impediment, and the uſe of the temple permits, the ſtatue which is placed in the cell may ſeem to look toward the evening region of the heavens; ſo that thoſe who approach the altar, to make their offerings, or perform ſacrifices, may look toward the eaſtern ſky, and to the image which is in the temple. By this means the temple, the eaſtern ſky, the ſupplicants and ſacrificers making their vows, and the image ſeeming to riſe to behold them, will all be ſeen at one view: for it is proper that the altars of the Gods ſhould be diſpoſed to the eaſt.

But if the nature of the place prevents that poſition, then the temple is to be turned to the view of the greater part of the city walls, and temples of the Gods; or ſhould ſacred fanes be built near a river, like thoſe near the Nile in Egypt, they ſhould look toward the banks of the river; ſo likewiſe, if near a public way, they ſhould be ſo ſituated, that the paſſengers may behold it, and pay their ſalutations.

CHAPTER VI.

Of the Proportions of the Portals of Temples.

THE rules relating to the portals of temples, and their antepagments (E), are theſe: firſt, it is to be determined of what kind they are to be made; for there are theſe kinds, Doric, Ionic, and Attic.

Fig. XXIX. and XXX. In thoſe of the Doric kind, theſe rules are to be obſerved: The top of the corona (A), which is placed above the upper antepagment, is made level with the top (o) of the capitals of the columns which are in the pronaos. The aperture or hypothyron is thus determined: The heighth from the pavement (B) of the temple to the lacunars (C), is divided into three parts and a half, of which two parts make the heighth of the aperture of the door. This (heighth) is divided into twelve parts, of which five and a

(1*) The Latin word *oſtia*, which ſignifies the aperture of the door, I have rendered portal, in order to preſerve the diſtinction between that and the framing of wood work, &c. made to cloſe or ſhut the ſaid aperture; and which is properly called the door.

(2*) The antepagments are the jambs of the door caſe, or perpendicular pieces of the architrave.

(3*) The lacunars have been before explained to be the cofers, or pannels. Thoſe in the cieling of the pronaos, which are thoſe here implied, were uſually on a level with thoſe in the ſoffite of the corona, as they are in the temple of Theſeus, at Athens; in that of the Sybil, at Tivoli; Veſta, at Rome, and divers others. They were placed ſometimes indeed at different levels, as at the top of the architrave, &c. But, as they were originally and moſt uſually at the level of the corona, and Vitruvius has ſpoken of no other than thoſe in the corona, we muſt ſuppoſe that he conſiders theſe which he here mentions to be on the ſame level.

(4*) This paſſage has, by all the tranſlators heretofore, been explained in a manner that no antique example has been found to authoriſe, and that has no reaſon of propriety or beauty to recommend it: they ſuppoſe that the corona of the cornice is intended by Vitruvius to be much more in heighth than all the reſt of the cornice, architrave and friſe together; as A, Fig. XXIX.

Vitruvius ſays that the top of the corona of the portal is to be made level with the top of the capitals of the columns in the pronanos; and at the ſame time directs the aperture of the door to be made of ſuch a heighth as cauſes the ar-

half make the breadth of the aperture at its bottom (B); and at the top it is contracted, if the heighth of the aperture is not more than ſixteen feet, as much as the third part of the antepagment. If the heighth is from ſixteen to twenty-five feet, the upper part of the aperture is contracted a fourth part of the antepagment. If from twenty-five to thirty, the upper part of the aperture is contracted an eighth part; and thoſe that are yet higher are to be diſpoſed perpendicular.

The antepagments (E) are made as thick in front as the twelfth part of the heighth of the aperture, and are diminiſhed at the top the fourteenth part of their thickneſs.* The heighth of the ſupercilium (D)* is equal to the thickneſs of the antepagment at the top. The

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thitrave, friſe, and under part of the cornice, to happen much lower; from whence it is ſuppoſed that he intends all the ſpace between to be occupied by the corona; which conſequently becomes of a monſtrous and diſproportionate heighth.

This is, as it muſt be univerſally allowed, ſo uſeleſs and unmeaning a deformity, and ſo contrary to all the known examples of the antique, that it encourages a ſuſpicion of its not being the intention of the author, and that it is a miſtake ariſing from ſome unaccountable error in the text.

I find two inſtances in the antique wherein the top of the corona of the portal is level with the tops of the capitals of the columns in the pronaos. Theſe are in the Doric temple at Cora, in Italy, and in the Sybils temple at Tivoli. But, in both theſe examples, the heighth of the aperture is two parts and an half, out of three and an half, from the pavement to the lacunars; whereas Vitruvius directs it to be no more than two parts.

If the heighth of the aperture is allowed two and an half, B B, Fig XXX, as in theſe examples; and all the other members are made in the proportions mentioned by Vitruvius; then, the top of the corona being made level with the top of the capitals, will cauſe the corona to be of a proper and moderate ſize, nearly equal with the abacus of the capitals; as figure XXX ſhews.

The agreement of theſe two examples in the ſame proportion, the ſuitableneſs of this proportion of the aperture to the diſtribution and proportion of all the other parts of the portal, the correſpondence of theſe ancient doors in all other reſpects to the deſcription of Vitruvius, joined with the incongruity and deformity that ariſes from the heighth of the aperture mentioned in the text, make it very probable that the error lies here, and that *duæ*, two, has been written inſtead of *duæ s.* or *duæ ſemis*, two and an half.

It is true that the generality of the ancient portals, which have come to our knowledge, are not ſo high in the aperture as thoſe of Cora and Tivoli: ſeveral of them agree with the text, and have but two parts, out of three and an half, from the pavement to the lacunars: ſuch are thoſe of the temples of Fortuna Virilis, Concord, and Veſta, at Rome (according to Palladio) and that of Pola, in Iſtria. But none of theſe are of the Doric or Attic kind; they are what Vitruvius calls the Ionic; whereas thoſe of Cora and Tivoli are both Attic; which, as Vitruvius hereafter ſays, is the ſame as the Doric, and which latter he is here deſcribing.

Thoſe ancient portals, that have the top of the corona level with the tops of the capitals of the columns, do not agree with the text in the proportional heighth of their aperture; and thoſe that agree in the heighth of their aperture have not the top of the corona level with the top of the capitals; nor can they have, unleſs ſome member of the entablature is made ſo unuſually large and diſproportionate as ſhocks the eye of the ſpectator. By theſe ancient examples, it appears that the Attic and Doric portals have, in their apertures, two and an half parts, out of three and an half, from the pavement to the lacunars; and the Ionic but two parts: and that the former have the top of the corona level with the top of the capitals, but the latter have not. I therefore conjecture, that Vitruvius has, in the deſcription, inadvertently united the proportion of the Ionic portal with that ſingularity of the Doric, of having its corona level with the top of the capitals, or elſe that he has written *duæ s.* for *duæ ſemis*; the *s*, according to cuſtom, ſtanding for *ſemis*, which the copyiſts have miſtakenly ~~ſuppoſed~~ ſupplied; and that thus the error has ariſen. Whether or no this conjecture may be ſatisfactory and well founded, I ſubmit to the deciſion of the public. I cannot, however, be of opinion that Vitruvius could ever intend ſo exorbitant and diſproportionate a member as that large corona. Propriety, beauty, and the example of antiquity, conſpire to decry it. In practice, therefore, it appears to me moſt adviſeable to make the heighth of the aperture in Doric portals like thoſe of Cora and Tivoli: viz. 2 ½ to 3 ½; and, in Ionic portals, to give the aperture the heighth mentioned in the text: viz. 2 to 3.

(5*) Thus the portal of the Sybils temple at Tivoli, and that of Cora, are contracted.

(6*) In this place the ſupercilium ſignifies the level part of the architrave, D.

cymatium (F) is to be made the ſixth part of the antepagment, and its projecture is equal to its thickneſs. The Leſbian cymatium[7*] (F), with the aſtragal, is to be ſculptured. Upon the cymatium, which is in the ſupercilium, the hyperthyrum[8*] (G) is to be placed, in thickneſs equal to the ſupercilium, and therein is to be wrought the Doric cymatium, leſbiam, aſtragal, ſima, ſculpture[9*] (H). Then the plain corona (A), with its cymatium, is formed, and its projecture is equal to the heighth of the ſupercilium, which is laid upon the antepagments. To the right and left projectures[10*] (I) are made, as far as the footings extend[11*]; and in the ungue[12*] (K), the ſame cymatiums are united.

Fig. XXXI. But if the Ionic kind is to be uſed, the heighth of the aperture being found in the ſame manner as for the Doric, the breadth is determined, by dividing the heighth into two parts and an half, of which one part and an half makes the breadth of the aperture at bottom. The contracture is the ſame as in the Doric. The thickneſs of the front of the antepagments (E), is the fourteenth part of the heighth of the aperture; their cymatium is the ſixth part of their thickneſs. The remainder, excluſive of the cymatium, is divided into twelve parts; three of which make the firſt corſa[13*] (a), with its aſtragal; four the ſecond (b), and five the third (c). Theſe corſes, with their aſtragals, extend all round. The hyperthyrum is formed in the ſame manner as that of the Doric. The ancons (L L), or prothyrides[14*], (as they are called) are wrought on the right and left, and, excluſive of the

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(7*) The Leſbian cymatium I judge to be an ogee, or ſima reverſa; becauſe the generality of the ancient portals known to us, have this moulding for the cymatium of their antepagments; and thus it is in the portal of Cora, which in ſo many other reſpects agrees with the deſcription of Vitruvius.

(8*) The hyperthyrum is the friſe, or the friſe together with the bed-mould of the cornice.

(9*) This ſentence is very obſcure, *& in eo ſcalpendum eſt cymatium Doricum, aſtragalum Leſbium ſima ſcalptura.* Vitruvius does not tell us in what part of the hyperthyrum theſe mouldings are to be wrought, nor their proportion; and it is doubtful how or what we are to underſtand by *aſtragalum Leſbium ſima ſcalptura.*

In the portal of the temple at Cora, the mouldings at the top of the hyperthyrum, ſerving as the bed-mould to the cornice, are a cavetto with its fillet; above that, dentils; and upon them, an aſtragal enriched with beads, having a fillet above and below it. Their proportion all together is two ſevenths of the heighth of the hyperthyrum. Vitruvius mentions no dentils, but a ſima; and places the aſtragal between that and the Doric cymatium.

(10*) The projectures here ſignified are doubtleſs thoſe which we call knees, made by the excurſion of the cymatium at the upper part of the antepagments; for we find ſuch projectures were frequently uſed in the works of the ancients, as in the windows of an ancient Ionic temple now remaining at Athens. In thoſe of the Sybil at Tivoli, and in the portal of the temple at Cora. In this laſt, the quantity of their projecture is equal to a fourth part of the breadth of the antepagment; and their extent from the top of the ſupercilium downward, is equal to the heighth of the whole ſupercilium, added to the heighth of its cymatium and faſcia; ſo that the knee of the facia ranges exactly with the bottom line of the ſupercilium.

(11*) Galiani ſeems to have rightly conceived this paſſage; the footing, or crepido, here mentioned is probably the cill, or ſtone, that bears the antepagments. Vitruvius, therefore, would have the knees project ſo far as to be perpendicular with the outſide of the antepagments at bottom.

(12*) Ungue, I imagine, expreſſes no more than the ſeveral turns or bends of the knee.

The great projection given to the corona ſeems to make it neceſſary to have truſſes (or ancons, as they are hereafter called); ſuch truſſes there are adjoining to the knees in the portal of the temple at Cora, as L L, Fig. XXX.

(13*) *The faſcia.*

(14*) The truſſes or conſoles: thoſe of the temple at Niſmes are, according to Palladio, formed narrower at bottom than at top, as here directed.

leaf, deſcend as low as the bottom of the ſupercilium. The thickneſs of theſe in front is the third part of the thickneſs of the antepagment; and, at bottom, they are a fourth part thinner than at top.

THE doors are ſo framed, that the cardinal ſcapi[15*] (d), may be the twelfth part of the whole heighth of the aperture. Out of twelve parts between the two ſcapi, the tympans[16*] (e) have three parts. The impages[17*] (f) are ſo diſtributed, that the heighth being divided into five parts, two ſuperior, and three inferior, are diſpoſed. Upon the middle the middle impages are placed; of the reſt, ſome are framed at top, and ſome at bottom; the breadth of the impage is the third part of the tympan; the cymatium (g) is the ſixth part of the impage; the breadth of the ſcapi (h) is the half of the impage; the replum[18*] (i) is

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(15*) Scapi are all the pieces in general, which are diſpoſed perpendicularly, and which we call ſtiles: the cardinal ſcapi I ſuppoſe to be the hinge ſtiles, or rather the door-poſts to which the doors are hinged. The ſcapi are mentioned twice afterward; the firſt mentioned of the two, I take to be the middle ſtiles of the door; and the other, the ſide ſtiles, (*i. e.*) thoſe next the antepagments. It is not determined whether each of the cardinal ſtiles is to have in breadth the twelfth part of the heighth of the aperture, or whether that meaſure is to be divided between both. I have choſen the latter: Galiani has altered *altitudinis*, in the text, to *latitudinis*, thereby making theſe cardinal ſcapi to be the twelfth part of the breath inſtead of the heighth.

(16*) The tympans are the pannels. Perault and Barbaro make but one pannel in the whole breadth of the aperture; but the manner in which the ſcapi are three times mentioned, proves, that there muſt be at leaſt four ſcapi exclusive of the cardinal ſcapi; and, conſequently, two pannels in the breadth: and this induces me to think that the twelve parts, out of which the tympan has three, are to be underſtood to be in the breadth of the aperture, between the two cardinal ſcapi, not in the heighth of the aperture, of which the cardinal ſcapi has before had one twelfth; for, thus underſtanding it, the meaſures allowed to the tympans, ſcapi, &c. are reconcileable with that of the breadth of the aperture, otherwiſe not.

(17*) The impages are ſuppoſed to be the horizontal pieces of the framing, called by us the rails. The tranſlators in general, excepting Galiani, have made but three in the whole heighth; one in the middle, and the other two at top and bottom of the door; but it is evident, by the expreſſion of the text, *ex reliquis alii in ſummo alii in imo, of the reſt, ſome above and ſome below*, and afterward mentioning one in the middle, that there muſt be at leaſt two impages, if not more, both above and below the middle one.

(18*) The replum has been variouſly interpreted; but the moſt general received opinion is, that it is the riſing part of the pannel, by us called the raiſing.

The twelve parts of the breadth are thus accounted for;

The two tympams, at 3 each,	6
The four ſcapi, at $\frac{1}{2}$ each,	2
The four replums, at $\frac{1}{3}$ and $\frac{1}{6}$ each,	$2\frac{2}{3}$
The four cymatiums, at $\frac{1}{6}$ each	$0\frac{2}{3}$
The middle aſtragals, or ſtaffs, n n,	$0\frac{2}{3}$
In all	12

After all, I am far from being ſatisfied that the deſign given by the other tranſlators, or myſelf, (though moſt correſpondent to the text I could imagine) is to be depended on as the true formation of the ancient doors. I rather believe (founding my opinion on the circumſtances of the deſcription) that they were framed in a manner of which we have at preſent no idea.

We imagine the ſcapi are the perpendicular, and the impages the horizontal margins of the door; why then ſhould the former be but half the breadth of the latter? We know not whether the cymatium is included, in the meaſure allowed to the impage, or excluded; whether it is at top of the impages only, or at bottom alſo; whether it projects or recedes, and whether it is to be applied to the ſcapi as well as to the impages; whether the middle impage is to be placed at the true middle of the heighth of the aperture, or that point which ſeparates two parts above from three below. We are not informed how many impages there are to be made above and below the middle one, nor how they are to be diſpoſed; and we know not what is certainly meant by the replum; wherefore the deſcription conveys to us no clear idea, but is obſcure and unintelligible; and the generality of the tranſlators have therefore contented themſelves with giving a draught of the doors according to their own fancy, without regard to its conformity to the words of the text.

the half and a ſixth part of the impage; the ſcapi (k), which are neareſt the antepagments, are alſo the half of the impage.

But if they are valved,[19*] the heighth remaining the ſame, the width of the door is augmented.[20*] If they are quadrifors, the heighth alſo is encreaſed.

Fig. XXX. The Attic kind are formed according to the ſame rules as the Doric, but have alſo corſes[21*] (n), under the cymatiums in the antepagments, worked all round, and ſo proportioned as to have two parts out of ſeven contained in the antepagment, excluſive of the cymatium; and theſe doors are not made with ceroſtrota[22*] ornaments, nor bifors, but valved; and they have apertures in the exterior parts.[23*]

These rules, which are practiſed in the compoſition of Doric, Ionic, and Corinthian temples, I have explained as well as I have been able, according to the approved methods. I ſhall now ſpeak of the compoſition of Tuſcan temples, and of the manner in which they ſhould be conſtructed.

(19*) This expreſſion implies, that the door juſt deſcribed is not of the valved kind, but it does not inform us what valved doors are. Galiani ſuppoſes them to be one-leaf doors; Perault, two-leaf doors, in this place; and in the following paſſage, one-leaf doors. It is certain they are neither two-leaf doors, called bifors, nor four-leaf doors, called quadrifors; becauſe Vitruvius here oppoſes them to both; and it is not probable that they are one-leaf doors; becauſe Vitruvius, after having allowed an ample width for the door deſcribed, ſays, if they are to be valved they muſt be wider; which implies that they are not one-leaf doors; for it is not to be ſuppoſed that doors that have but one leaf ſhould be directed to be made wider than thoſe that have two or more leaves; it is rather a reaſon for making them narrower. Indeed, we are not told the number of leaves in this deſcribed door; but thoſe that ſuppoſe the valved to be one-leaf doors, muſt ſuppoſe this to have two or more leaves; for it is evidently not a valved door, as before noted, and conſequently they muſt ſuppoſe the one-leaf door is directed to be made wider than a door of two or more leaves; which is abſurd and improbable.

The door deſcribed is probably a bifors, or two-leaved door, as Galiani conceives it; the diſtribution and proportion of the parts agree with ſuch a formation; if ſo, and if it ſeems likely that, as the valved doors are directed to be made wider, they have conſequently more leaves than the door deſcribed, and yet are not quadrifors; it is moſt probable that they are three-leaved doors, having the middle leaf hinged to one of the ſide leaves; and this opinion is, in ſome degree, confirmed by the order in which they are mentioned by Vitruvius; for he proceeds from the door deſcribed, which is probably a bifors, to the valved, and then to quadrifors.

(20*) The words of the text, *in latitudinem adjiciatur amplius foris latitudo*, ſeems to encourage a notion that the breadth of the aperture is to be encreaſed by as much as the breadth of one door, meaning, I ſuppoſe, one leaf, as Galiani has underſtood it; but I do not venture to render it in that ſenſe, becauſe the words will equally well bear the conſtruction I have choſen; and utility, as well as the authority of the antique, oppoſes ſuch a proportion, which makes the door almoſt as broad as high. We find none of the doors of the ancient temples much wider than half their heighth, though there are ſeveral that are higher than twice their width.

(21*) The corſes of the Sybil temple at Tivoli, and thoſe of the temple at Cora, are formed according to this rule.

(22*) Ceroſtrota is mentioned by Pliny as a kind of inlaid work.

(23*) Some have rendered this paſſage, the doors open outward; others render it as I have done. The text is, *& aperturas habent in exteriores partes*: the ſenſe depends on the acceptation of the word *aperturas*, whether it ſignifies apertures; or, the action of opening.

CHAPTER VII.

Of the Proportions of Tuſcan Temples.

Fig. XXXII. THE length of the place (m m), on which the temple is erected, being divided into ſix parts, one is deducted, and the remainder given to the breadth (k k). The length is divided in two parts; the interior part (m n) is aſſigned for the ſpace of the cell, and that next the front is left for the diſpoſition of the columns. The breadth is divided into ten parts; of which, three to the right and left are given for the leſſer cells (a), or for the places of the wings (b); the remaining four are allotted to the middle temple (h). In the ſpace of the pronaos (B), which is before the cells, the columns are ſo diſpoſed, that thoſe of the angles (d) may ſtand oppoſite to the antæ (c), at the extreme parts of the walls. The middle two (e), oppoſite the part of the walls which is between the antæ and the middle temple, are ſo ſituated, that, between the antæ (c), and the prior columns (d), in the middle of the ſame line, others (g) may be diſpoſed.

Fig. XXVII. THE thickneſs of theſe columns at bottom is the ſeventh part of their heighth; their heighth is the third part of the breadth of the temple; and the tops of the columns are diminiſhed a fourth part of the thickneſs of the bottom. Their baſes (r a) are in heighth the half of their thickneſs, and have a circular plinth (r) as thick as half their heighth.

THE torus above, with the apophygis (a)[1*], is as thick as the plinth. The heighth of the capital (k h) is half the thickneſs of the column. The breadth of the abacus (k) is equal to the thickneſs of the column at bottom. The thickneſs of the capital is divided into three parts; one of which is given to the plinth (k), that ſerves for the abacus; another to the echinus (i), and the third to the hypotrachelian (h), with the apophygis (b).

(1*) Apophygis is the fillet, or ſquare, that terminates the ſhaft of the column at the top and bottom. In the 1ſt chapter of this book, it is called apotheſis. Philander and Barbaro have added *aſtragals* to the text, where only *apophygis* is mentioned; in which they are followed by Perault and Galiani, they believing that the apophygis there mentioned is the fillet, c. Fig. XXVII, at the bottom of the hypotrachelion, or rather at the top of the column. Nevertheleſs, I am of the opinion of Palladio, that it here means the fillet, b, under the echinus; and I judge that Vitruvius has purpoſely avoided mentioning the aſtragal and fillet, d, at the top of the column, as being no part of the capital: for in deſcribing the Doric capital at the third chapter of this book, he alſo omits mentioning the ſame aſtragal and fillet.

At the firſt chapter of this book, where he deſcribes the Corinthian capital, he ſpeaks of ſuch an aſtragal as being at the top of the ſhaft of the column, but does not deſcribe its proportion; we may therefore conclude, that though he allows of its uſe, he conſiders it as a part of the ſhaft, and no ways belonging to the capital; for which reaſon he makes no

Upon the columns the compacted beams (e) are laid, being in heighth as much as the magnitude of the work may require, and in thickneſs equal to the hypotrachelium at the top of the columns. They are to be joined in ſuch a manner with mortiſe and tenon, as to leave a vacancy of two digits (1 inch and $\frac{1}{2}$) in the joints; for, if they touch, and admit not the air between them, they ferment, and quickly decay. Over the beams, and over the walls,[2*] the mutules (f) are projected the fourth part of the heighth[3*] of the columns, and antepagments[4*] are fixed in their fronts. Upon theſe the tympan of the faſtigium is built, either of maſonry or timber; and thereon, the faſtigium, columen, canthers, and templats,[5*] are ſo diſpoſed, that the gutters of the whole roof may correſpond in a triple number.[6*]

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mention of it in deſcribing the capital; for theſe reaſons, I believe the apophygis here mentioned cannot be that below the capital, but that under the echinus within the capital.

We find the aſtragal and fillet, or apophygis, d, at the top of the ſhaft of columns, generally uſed in the Roman works, though not always in thoſe of the Greeks; as, therefore, their uſe is authorized, and Vitruvius has omitted to give us their proportion, I ſhall copy them from the Theatre of Marcellus, in which the proportion of the aſtragal and fillet together is the fifteenth part of the diameter of the column.

(2*) Theſe walls I conceive to be the lateral and back walls of the temple; which, therefore, ſhould be built up to the level of the top of the beams, which lie over the columns, in order that the mutules may be upon a level all round the temple. Several of the tranſlators have underſtood them to be walls built upon the beams, by way of friſe; without any reaſon for ſuch opinion, more than what is here mentioned. But, if that had been the caſe, I think Vitruvius would not have failed to particularize their ſituation and heighth, becauſe they materially affect the aſpect and proportion of the temple.

(3*) None of the tranſlators have been able to prevail on themſelves to believe that the mutules are intended to project ſo far as is equal to a quarter of the heighth of the columns. Wherefore Galiani has ſuppoſed it ſhould be read a quarter of the thickneſs of the columns, and accordingly has altered the text from *altitudinis* to *latitudinis*. But, if they had ſeen our church in Covent-Garden, the work of the famous Inigo Jones, they would not have been ſo dubious of the meaning of the text. In the ordination of this church, it ſeems as if Inigo Jones had intended to put in practice the rules given by Vitruvius for the conſtruction of Tuſcan temples.

(4*) What is here meant by the word antepagments is uncertain; Galiani thinks it means ornaments in a general ſenſe; it may ſignify ſome moulding affixed to the fronts of the mutules, like thoſe of the antepagments or architrave of doors, as g, Fig. XXVII; or, as I obſerve, no mention is made of any corona, &c. to cover the mutules (which, nevertheleſs, is abſolutely neceſſary and indiſpenſable;) it may be ſome mouldings lying above the mutules, and appearing like a cornice, as Piraneſi, has repreſented it in his Magnificenza di Roma.

(5*) Theſe timbers have been before explained at the ſecond chapter of this book.

(6*) This paſſage is very obſcure and variouſly underſtood; *ut ſtilicidium tecti abſoluti & tertiario reſpondeat.*

The interpretation that occurs to me is, that the waterſpouts, which are to diſcharge the rain from the roof of the temple, are to be three in either flank anſwering each other, as i, k, l, fig. XXXII, and which fall very aptly over the columns, antæ, and middle, of the cell, at equal diſtances; as in other temples, they have been deſcribed to be in the lions heads over each column in the flanks. Galiani ſuppoſes theſe words import, that dripping eaves (as our workmen call them) are to be formed on three ſides of the temple, the back part of the roof being ſloped like the flanks; and Perault, and others, have ſuppoſed the word tertiaro (following the ſignification of that word as given in Baldus's dictionary) to mean the pediment or hips of the roof; tranſlating the paſſage to this effect, *the ſlope of the roof is to agree with the pediment*; and Perault has added, without any authority, *which ought to be much elevated.* By this interpretation, they entirely neglect the word *ſtilicidium* (i. e. the gutters or channels;) which appears to me to be the principal in the ſentence; for it is the gutters which Vitruvius ſays ſhould correſpond in *tertiario*; a word relative to the number three; the paſſage, therefore, plainly ſignifies that the gutters are in ſome manner to correſpond in that relation.

Fig. XXXIII. They alſo erect round temples, of which ſome, built with columns, without a cell, are called monopteral,[7*] and others peripteral. Thoſe which are made without a cell, have a tribunal and an aſcent[8*] (a), equal to a third part of their diameter. Upon the ſtylobata (a), the columns are raiſed, equal in heighth to the extreme diameter of the walls of the ſtylobata; their thickneſs is the tenth part of their heighth, including the capitals and baſes. The epiſtylium is in heighth equal to half the thickneſs of the columns. The zophorus, and the other members which are placed above, conform to the rules written in the third book.

Fig. XXXIIII. But if theſe temples are to be made peripteral, two ſteps (b), and the ſtylobata (a), are built at the bottom; then the wall (c) of the cell is made receding from the ſtylobata, about the fifth part of the breadth[9*]; and at the middle of the approach is left the place of the doors (d). The cell (e), excluſive of the walls, is equal in diameter to the heighth of the columns above the ſtylobata. The columns around the cell are formed according to the ſame proportions and ſymmetry as has before been mentioned. The proportion of the roof in the middle is ſuch, that half the diameter of the whole work makes the heighth of the tholus[10*] (g), excluſive of the flower. The flower[11*], without the pyramid,

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(7*) Monopteral ſignifies having but one wing or aile.

(8*) The tribunal and aſcent, here mentioned, is evidently the pedeſtal, or podium, upon which the columns ſtand; for immediately after it is called ſtylobata. There was, no doubt, a flight of ſteps in the front to aſcend this podium, though Vitruvius gives us no information concerning them; but Piraneſi, in his Magnificenza di Roma, gives us a repreſentation of a temple of this kind, which he diſcovered on an ancient fragment, in the Villa Medici at Rome, where the ſteps appear to be raiſed between the two front columns; alſo Palladio and Serlio, who drew the Sybils temple at Tivoli many years paſt, have placed the ſteps in the front intercolumn; and the preſent ruins of that temple evince that they could have been in no other place, or have extended farther; the podium mouldings ſtill remaining under the column adjoining to the front intercolumn: I have accordingly repreſented the ſteps in that manner, in my draughts, Fig. XXXIII and XXXIV. The text very clearly expreſſes that the heighth of this tribunal, or podium, is to be equal to the third part of its diameter, as it is found in the examples above-mentioned; yet, (for what reaſon I know not) none of the tranſlators have conformed thereto in their draughts.

(9*) Vitruvius ſays about the fifth part. In the Sybils temple at Tivoli, and in the temple of Veſta at Rome (both of them round temples of this kind) the receſs of the wall of the cell, from the front of the ſtylobatæ, is equal to a third part of the heighth of the columns; ſo that when the diameter of the cell, including the walls, is made equal to the heighth of the columns, as it is in the Temple of Veſta, the ſaid receſs is exactly a fifth part of the whole diameter.

(10*) The tholus is the cupola, or dome; it ſometimes ſignifies the center ſtone or ornament in the crown of the dome. Concerning the figure of the dome of the cell, which appeared above the entablature of the columns, we can draw no information from the antique, that part of the temple at Tivoli being deſtroyed; but there is a part of the wall of the cell ſtill left, which riſes above the level of the cornice, and which ſhews no inclination from the perpendicular like the arch of a dome; ſo that the ſpringing of the dome muſt have been above that part, if any dome there was; for in the relievo of the monopteral round temple, in the villa Medici, there is no dome, but a blocking, or plinth, upon the cornice; and above that, a roof, like that of the Tower of the Winds at Athens; the ſtones that formed the roof being, in the ſame manner, cut into the figure of tiles.

(11*) We know not the figure of the flower here mentioned; but, as it is ſaid to be of the ſize of the capitals of the columns, it may alſo have been of a ſimilar ſhape; for thus it was found to have been in the Temple of the Winds at Athens, according to Mr. Stuart.

The temple of the Sybil at Tivoli, agrees very aptly, in ſo much as remains of it, with the deſcription here given; that of Veſta at Rome is alſo very ſimilar; but, in this latter, the diameter of the cell, including the walls, is equal to the heighth of the columns; whereas in the former the cell is of that diameter, excluſive of the walls; therein conforming to the rule here given; Vitruvius has mentioned the thickneſs of the wall of the cell, in the temple at Tivoli above-mentioned, it is of the ſame thickneſs as the columns around it.

is equal in ſize to the capital at the top of the columns. All the other parts are to be made according to the proportions and ſymmetry already deſcribed.

WITH the ſame ſymmetry, temples of other kinds, and of different diſpoſitions, are produced; ſuch as, the temple of Caſtor, in the Circus Flaminius; and that of Vejovis, between the two groves; or as the more ingenious temple of Diana of the Woods, having additional columns to the right and left, on the flanks of the pronaos. The temples that were firſt built of the kind like that of Caſtor in the Circus, was the temple of Minerva in the citadel[12*] of Athens, and of Pallas, at the promontory of Sunium in Attica; for the proportions of theſe are not different, but the ſame; the length of the cells being double the breadth; and the other exiſona[13*], which are uſually in the fronts, are transferred to the ſides.

SOME alſo taking the diſpoſition of the columns of the Tuſcan kind, uſe them with the ordination of Corinthian and Ionic works; for, by erecting two columns, in the places where the antæ procur into the pronaos from the walls of the cell, they render the Tuſcan and Grecian works of common principles.

Fig. XVI. and XVII. OTHERS, removing the walls of the cell to the intercolumns of the pteromatos[14*], by that removal of the walls, render the chamber of the cell more ſpacious; and by preſerving the ſame proportions and ſymmetry in the other parts, produce another kind of temples, named *pſeudoperipteros*[15*]. Temples of this kind are apropriated to the uſe of ſacrifices: for the ſame kinds of temples are not erected indiſcriminately to all the Gods, becauſe the ſacred rites performed to each are different.

(12*) Here, as well as at the firſt chapter of the ſecond book, the word *arce* has evidently the ſignification of citadel; at the twelfth chapter of the fifth book, it ſignifies *dams* or *fences*.

(13*) We are ignorant of the meaning of the word *exiſona*, it not being uſed by any other author. In the draught of this temple of Minerva, given by Le Roi, in his Ruins of Greece, we find nothing ſingular in the flanks that is tranſferred from the front. The columns, entablature, &c. on the flanks, have the ſame form and proportion as thoſe in the front; the word (*exiſona*) therefore, may ſignify nothing more than the proportions, and ordination of the building in general; for Vitruvius, having juſt mentioned the proportions of the cell, immediately after adds, *& uti reliqua exiſona, the other exiſona.*

This temple, according to Le Roi, has eight columns in front and ſeventeen in the flanks, including thoſe at the angles; and there is another range of ſix columns, behind the front columns, forming a kind of double portico; the poſticus is alſo built in the ſame manner; but the proportion of the cell is not as Vitruvius has deſcribed it, being much longer than double its breadth. There is, however, an ancient temple at Pæſtum of this kind, whoſe cell is in length twice its breadth exactly. *See Major's Ruins of Pæſtum.*

(14*) This paſſage evidently proves that the word *pteromatos* does not ſignify the whole circuit of the periſtyle round the cell, as Galiani ſuppoſes: for in the ancient pſeudodipteral temples ſtill remaining (which are thoſe of Concord, Fortuna Virilis, and that of Niſmes in France) we find the ſpace of the pronaos left open, and not engroſſed by the cell, as the ſpace of the walks in the flanks and poſticus were; it therefore can only ſignify the walks on thoſe three ſides; but it more probably only means the walks in the flanks, becauſe that in the back front was particularly diſtinguiſhed by the name of poſticus. As, therefore, pronaos and poſticus were the common names of the walks in the front and rear, ſo pteromatos was probably the name of thoſe in the flanks.

(15*) Pſeudoperipteros (*i. e.*) falſe winged round.

Thus I have explained the rules of all kinds of temples as they have been imparted to me; and have diſtinguiſhed their order, the ſymmetry of their parts, wherein they are different in figure, and in what each reſpectively differs, as well as I have been able. I ſhall now ſpeak of the altars of the immortal Gods, and of their proper diſpoſition for the rites of the ſacrifices.

CHAPTER VIII.

Of the Altars of the Gods.

ALTARS ſhould regard the eaſt,[1*] and be always placed lower than the ſtatue which is in the temple, that the ſupplicants and ſacrificers may look upward to the divinity, and ſtand, as decorum requires, at a different heighth to the God. The heighths of altars are ſo adjuſted, that thoſe of Jupiter, and all the celeſtial Gods, may be diſpoſed as high as convenience will admit. Thoſe of Veſta, and the Gods of the earth and ſea, are ſituated lower. By theſe inſtructions the diſpoſition of the altars in the middle temples[2*] may be properly contrived.

In this book is explained the compoſition of temples. In the following we ſhall give the rules for the diſtribution of public buildings.

(1*) Vitruvius has told us, at the fifth chapter foregoing, that altars ſhould face the eaſt, and that the ſtatue ſhould face the weſt, ſo that the altar and ſtatue faced different ways; yet, he there ſays, the ſacrificers look toward the ſtatue and to the eaſt, and that the ſtatue faces them; this is irreconcilable and contradictory; ſo that, I imagine, we muſt underſtand, by the words *ara ſpectant ad orientem*, that the altars ſhould be ſituated at the eaſt end of temples, and conſequently face the weſt.

(2*) I have tranſlated *in mediis ædibus*, *in the middle temples*, as I think the words import; meaning thereby the cell of the temple, not the middle of the temple, as Galiani reads it; for it is more probable that the altars were placed toward the end oppoſite to the entrance; by that means leaving more room for the ſacrifices, cauſing the whole aſſembly to ſtand before the image of the God, not partly behind it, and giving to the whole an appearance of more dignity. Alſo, the note foregoing helps to determine the point, for by that it appears probable that they were placed on the eaſt ſide.

THE END OF THE FOURTH BOOK.

THE ARCHITECTURE OF *M. VITRUVIUS POLLIO.*

BOOK THE FIFTH.

PROEM.

MANY authors, O Emperor! who, in voluminous works, have written of ingenious arts and inventions, have given great and ſingular reputation to their ſubject; would alſo that our art might be here ſo explained, that its reputation might, by theſe precepts, be augmented! But all that may be deſired is not eaſily obtained; for architecture cannot be treated like hiſtory or poetry. Hiſtory, of itſelf, engages the attention of the reader by the variety and novelty of the relations. Poetry alſo, by the meaſure and cadence of the verſes, the agreeable diſpoſition of the words and ſentences, and the juſt pronunciation of the lines, allures the ſenſes of the reader, and entices him, without ſeeming tedious, to the concluſion of the poem. But this cannot be done in writing of architecture; becauſe the peculiar terms of the art being unuſual, render the ſenſe of the diſcourſe obſcure. The terms therefore being of themſelves abſtruſe, and withall being uncuſtomary, if the various precepts are not contracted, and briefly and clearly explained, the diſcourſe will be often unintelligible, and the reader uncertain of its meaning.

IN ſpeaking therefore of the unknown names and meaſures of the members of buildings, I briefly expreſs them, that the mind may conceive and the memory retain them more eaſily; conſidering alſo, that the attention of the citizens is ſufficiently engaged by the public affairs

of the city, as well as their own private concerns, I judge it proper to write briefly, that, in their ſmall intervals of leiſure, they may ſoon read and underſtand the ſubject. Pythagoras, and thoſe who followed his opinions, choſe to write the precepts of their doctrine in a cubical diſpoſition, the cube being conſtituted of CCXVI* verſes, of which, they maintain, each precept ſhould occupy no more than three.

The cube is a figure of VI ſquare equal ſides, ſo that being thrown, on which ſide ſoever it falls, it remains ſtedfaſt and immoveable, till it is removed by force; ſuch are the dice which the gameſters throw on hollow tablets. Hence the compariſon ſeems to be derived; for this number of verſes, like the cube, fixes ſtedfaſtly in the memory that which ſoever meets the ſenſes. The Greek dramatic poets alſo divide the action of the fable in ſuch a manner, that the parts have a cubical relation to each other, interpoſing the ſongs of the chorus, to give reſpite to the pronunciation of the actors. As therefore our anceſtors have uſed ſuch methods, and as the ſubject on which I write is to many unknown and obſcure, I think it moſt proper to deſcribe it in ſhort books, that it may be more eaſy to the underſtanding of the reader. The ſubjects are likewiſe ſo arranged, that thoſe of the ſame kind are explained in one place, and not ſeparately diſpoſed; for thus they will more readily be comprehended.

In the third and fourth books I have explained, O Cæſar! the proportions of temples; in this, I ſhall treat of the proper diſpoſition of the public buildings; and firſt of the forum, becauſe therein the magiſtrates regulate both public and private affairs.

(*) The cube of 6. See note 6, chap. I. book III.

CHAPTER I.

Of the Forum.

THE Greeks make their forums ſquare, with large double porticos, the columns cloſe together, and adorned with ſtone or marble epiſtyliums, making ambulatories in the upper ſtories: but the cities of Italy follow not the ſame method; becauſe, by ancient cuſtom, the ſhews of gladiators are uſually given in the forum. For this reaſon the intercolumns around the area are made wider; and in the ſurrounding porticos the ſhops (a) of the bankers are diſpoſed, with galleries in the upper floors, properly adapted for the uſe and management of the public revenue. *Fig. XXXV.*

THE magnitude of the forum (A) ſhould be ſuitable to the number of the people, that it may not be too ſmall for uſe, nor, on account of the ſcarcity of people, appear too large. The proportion is ſo determined, that the length being divided into three parts, two are given to the breadth: for thus it will be of an oblong form, and convenient for the uſe of the ſhews.

THE upper columns are made a fourth part leſs than the lower; becauſe, as the inferior ſuſtains the greater weight, it ſhould be ſtronger than the ſuperior: alſo, becauſe it is proper to imitate nature; for, in ſtraight growing trees, ſuch as the fir, cypreſs, and pine, there are none thicker at the top than at the root; and, as they grow in heighth, they gradually diminiſh to the uppermoſt point. Following therefore the example of nature, it is proper that the ſuperior ſhould be made leſs than the inferior, both in heighth and thickneſs.

THE baſilica (B) ſhould be adjoined to the forum on the warmeſt ſide, that the negotiants may confer together, without being incommoded by the weather. The breadth is not made leſs than the third, nor more than the half of the length, unleſs the nature of the place oppoſes the proportion, and obliges the ſymmetry to be different. But if

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(i*) Galiani remarks that this proportion alludes to the middle diviſion, or nave, excluſive of the portico on either ſide; becauſe the Baſilica, Vitruvius afterwards deſcribes of his own deſigning, does not otherwiſe conform to his own rule.

On the contrary, I am of opinion that the whole extent of the baſilica is here meant, and that the baſilica deſigned by Vitruvius was an exception to the general rule; for, after having deſcribed the common baſilicas, he ſays, *Neither will baſilicas, like that at Fanum, which I deſigned and conducted, have leſs dignity and beauty:* which words clearly indicate it to be of a different form and proportion from thoſe he had been deſcribing. The draught I have given is of that at Fanum, which is hereafter deſcribed; the ſimplicity of the others render them eaſily conceivable by the verbal deſcription.

the baſilica has too much length, chalcidicæ[2*] are made at the ends, as they are in the baſilica of Julia Aquiliana. The columns of the baſilica are made as high as the porticus is broad. The porticus is the third part of the ſpace in the middle. The upper columns are leſs than the lower, as above written. The pluteum[3*], which is between the upper columns, ſhould alſo be made a fourth part leſs than the ſame columns, that thoſe who walk in the floor above may not be ſeen by the negotiators below. The epiſtylium, zophorus, and coronæ, are proportioned to the columns, in the manner explained in the third book.

Fig. XXXV. Nor will baſilicas of the kind of that at the colony of Julia of Fanum, which I deſigned and conducted, have leſs dignity and beauty; the proportions and ſymmetry of which are as follows: The middle teſtudo[4*] between the columns is CXX feet long, and LX feet broad. The porticus (b) around the teſtudo, between the walls and columns (c) is XX feet broad. The heighth of the continued columns (c), including their capitals, is L feet, and the thickneſs five, having behind them paraſtatæ (d) XX feet high, two feet and a half broad, and one foot and a half thick, which ſuſtain the beams that bear the floors of the porticos. Above theſe are other paraſtatæ (e) XVIII feet high, two feet broad, and a foot thick, which alſo receive beams ſuſtaining the canthers of the porticos, which are laid below the roof of the teſtudo: the remaining ſpace (f) that is left between the beams which lay over the pariſtatæ, and thoſe which lay over the columns, is left open in the intercolumns, in order to give light. The columns in the breadth of the teſtudo, including thoſe of the angles to the right and left, are four; and in the length, on that ſide which is next the forum, including the ſame angle columns, eight. On the other ſide, there are but ſix columns, including thoſe of the angles, becauſe the middle two on this ſide are omitted, that they may not obſtruct the view of the pronaos (C) of the temple of Auguſtus, which is ſituated in the middle of the ſide wall of the baſilica, looking toward the center of the

(2*) Various are the conjectures concerning the chalcidicæ and their uſe, but none can be depended on, becauſe there are no data from which any inferences may be drawn; from what is here ſaid of them, we can draw no farther knowledge than that they were ſome kind of apartments ſeparated by a partition at the ends of the baſilica.

(3*) In the ſeventh chapter of this book, it evidently appears that the pluteum is ſome part between the cornice of a lower order and the columns of an order immediately above, and its heighth is the two ninths of the heighth of the incumbent columns: alſo, in the ſaid chapter, the continued pedeſtal at the bottom of the ſcene, called pulpitum, is afterward referred to by the name of podium and lower pluteum. Theſe circumſtances demonſtrate that the pluteum is a kind of podium. This podium is here deſcribed to be between, not under, the columns, and it is to be a fourth part leſs than the ſaid columns. Whether leſs in heighth or in thickneſs is not mentioned; but moſt probably the former is meant, conſidering the purpoſe it is to anſwer. In this caſe, its heighth is nearly equal to that of the columns, which heighth greatly exceeds the proportion uſually given to a podium; but as Vitruvius, in his deſcription of the parts of the orders, makes no mention of the proportion of the ſtylobatæ or podium, it may be ſuppoſed the proportions of theſe things were unlimited, and depended wholly on the option of the deſigner, or their particular uſe. This is confirmed by the examples of the antique, in which they are found of all proportions, from a third to a ſixth part of the heighth of the incumbent column. In this latter proportion they are ſeen, in the remains of the Poikile at Athens. And in the ſcene deſcribed by Vitruvius, at the ſeventh chapter of this book, the loweſt podium, or pulpitum, is a third part of the heighth of the incumbent column: the middle podium is two ninths, and the upper one a ſeventh part of the ſaid heighth.

(4*) By the middle teſtudo is to be underſtood the middle part, or nave, which, from this expreſſion may be ſuppoſed, to be vaulted above, in a flat arch, like the back of the teſtudo or tortoiſe; for the Romans diſtinguiſhed ſuch kind of arches by that name.

forum (A) and temple of Jupiter (H.) The tribunal (g) in this building is formed in the figure of a hemicycle: the extent of this hemicycle in front is XLVI feet, and the receſs of the curvature inward XV feet, ſo that thoſe who attend the magiſtrate obſtruct not the negotiants in the baſilica.

UPON the columns, the compacted beams, (h) made from three timbers of two feet, are placed around; and theſe, from the third columns (c) which are in the interior part, are returned to the antæ (i) that procur from the pronaos, and on the right and left touch the hemicycle.

UPON the beams, perpendicularly to the capitals, the pilæ (k) are placed, three feet high and four feet broad, on every ſide. Over theſe, other beams (ll) well wrought from two timbers of two feet, are placed around; upon which, the tranſtræ and

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(5*) The tribunal built by Romulus, in the forum, is ſaid to have been in the figure of an half moon. At chap. VII. book IV. Vitruvius calls the prodium, under the columns of round temples, a tribunal; hence we may infer, that the hemicycular tribunal here mentioned, was an erection in the nature of a podium, large altar, or pedeſtal.

(6*) Hemicyclus is uſually accepted in the ſenſe of ſemicircle; but the proportion here aſſigned it proves that the word cyclus was not applied ſolely to a perfect circle, but was expreſſive of every kind of rotund figure, whether circular or eliptical.

The proportion here mentioned very nearly agrees with that of the cycloid, a curve formed by a point, in a wheel, rolling one revolution, and conſequently whoſe baſe line is to its altitude, as the circumference is to the diameter of a circle, and as is very nearly 46 to 15; this curve, however, is thought to have been unknown to the ancients, and was firſt noticed among the moderns by Father Merſennus, and annalized by Des Cartes.

(7*) Galiani ſuppoſes theſe three timbers were diſpoſed altitudinally, making an architrave of ſix feet high, which is much too large for the columns, and beyond all example.

Perault ſuppoſes a miſtake in the text, and that four, inſtead of three, timbers ſhould be read; ſuppoſing them to have been diſpoſed, two altitudinally and two latitudinally, ſo as to form a ſquare of four feet. But, without regarding whether they were diſpoſed altitudinally or latitudinally, though my opinion leans to the latter, I ſuppoſe the architrave, both in heighth and breadth, to have been of its due proportion, and that from theſe timbers it was wrought and reduced to that proportion which ever way they were diſpoſed; for Vitruvius ſays, *Ex tribus tignis bipedalibus*; thereby implying, that the beam was wrought to its proper ſize out of or from theſe three timbers; ſuppoſing them, therefore, to have been placed latitudinally, they muſt have been reduced from 6 feet to 4 feet 5 inches and ½ (the ſize of the neck of the column) including the void of two inches to be left between each timber. In altitude, I ſuppoſe each timber to have been of ſuch a meaſure as was ſufficient to form the heighth of the architrave; for in deſcribing the Tuſcan order, at Chap. VII. Book IV. Vitruvius ſays, *The compacted beams are to be in height as much as the magnitude of the work may require, and in thickneſs equal to the top of the column.* See h, Fig. XXXV, and in ſection B B.

(8*) By theſe words, either the beams which are placed upon the columns, or the antæ of the pronaos of the temple of Auguſtus, are ſaid to touch the hemicycular tribunal on either ſide; it is no matter which is allowed, becauſe the beams are deſcribed to extend no farther than the ſaid antæ. Hence the tribunal could have been ſituated no farther back than the ſaid antæ, nor forwarder than the columns of the teſtudo. But all the preceding tranſlators, not thinking it poſſible (as I ſuppoſe) that the tribunal could have that ſituation, without obſtructing the view of the temple of Auguſtus (becauſe they imagined the tribunal to have been a receſs formed in a high wall) have placed it at the farther end of the temple, at a great diſtance from the baſilica; and Perault has added a few words to the text, to make it bear that conſtruction. But it cannot be admitted, the baſilica, being the court of juſtice, is the proper place for the tribunal; and, beſide, the words, *uti eos qui apud magiſtratus ſtarent negotiantes in baſilica ne impedirent (ſo that the negotiants in the baſilica are not obſtructed by thoſe who attend the magiſtrates)* ſtrongly imply, that the tribunal was attached to, or in the baſilica; for it is attributed only to its *curvilinear* receſſion, that it did not obſtruct the negotiants in the baſilica.

The tribunals have been before ſaid to be a kind of large pedeſtal; and therefore, being of no great heighth, could not obſtruct the view of the temple of Auguſtus, although placed before it. My opinion therefore is, that the tribunal was ſituated as ſhewn by g, fig. XXXV.

(9*) Theſe pilæ ſeem to have been a kind of blockings, lying upon the beams or architrave, in the place of the friſe, and which ſupported other beams or plates that lay in the place of the lower part of the cornice. See k, in the ſection marked B B.

cupreols, being placed coincident with the zophorus, antæ, and walls of the pronaos, ſuſtain one culmen (m) the whole length of the baſilica, and another (n) tranſverſely from the middle over the pronaos of the temple: ſo that it cauſes a double diſpoſition of the faſtigium, and gives an handſome appearance to the roof on the outſide, and to the lofty teſtudo within. Alſo the omiſſion of the ornaments of the epiſtylium, and of the upper columns and plutei, diminiſhes the labour of the work, and ſaves great part of the expence. The columns likewiſe being carried in one continued heighth up to the beams of the teſtudo, encreaſes the magnificence and dignity of the work.

CHAPTER II.

Of the Treaſury, Priſon, and Curiæ.

Fig. XXV. THE treaſury (E) priſon (F) and curiæ (D) are adjoined to the forum, and are to be of ſuch a magnitude, that their ſymmetry may correſpond thereto. The curiæ chiefly, is firſt to be made ſuitable to the dignity of the community or city; and, if it is ſquare, its heighth is to be equal to once and an half of its breadth; but, if it is oblong, the length and breadth being added together, the half of that united ſum is given to the heighth, up to the underſide of the lacunars: alſo, at the half of the heighth, the walls are encompaſſed with coronæ of wood or plaiſter; for otherwiſe, the voice of the ſpeakers aſcending to the top, would not be heard by the audience; but, when the walls are encompaſſed with a cornice, the voice, being reflected before it is diffuſed in the air above, will be rendered ſenſible to the ears of the aſſembly.

(10*) The mutules and cupreols have been before mentioned to be the principal rafters and braces. They are ſaid to be coincident with the zophorus; from whence, I imagine, it is to be underſtood, that they reſted perpendicularly over the blockings or pile, which were diſpoſed in the place of the zophorus, or frize.

(11*) The culmen is the horizontal piece of timber in the ridge of the roof, which we call the ridge-piece. See note 1*. chap. II. book IV.

(12*) Galiani remarks, that it is not eaſy to conceive what is meant by *duplex faſtigiorum diſpoſitio*, a *double diſpoſition of the faſtigium*. The faſtigium being the triangle or pediment of the roof, continued through the whole length of the building, the ridge of which is the culmen, and it being ſaid there are two culmens, one extending the whole length of the baſilica, and another tranverſely from the middle over the pronaos of the temple, which therefore muſt croſs the former at right angles, exactly in the middle of the baſilica, there conſequently happens a double faſtigium, the one extending over the length of the building, the other over the breadth, interſecting each other in the middle, B, of the baſilica.

(1*) The curia was an hall or apartment, in which the ſenate, or legiſlature of the ſtate, aſſembled.

CHAPTER III.

Of the Theatre and its Situation.

WHEN the forum is finiſhed, then a healthy ſituation muſt be ſought for (according to the rules given in the firſt book) wherein the theatre may be erected, for the purpoſe of exhibiting the ſports on the feſtival days of the immortal Gods. For the ſpectators, with their wives and children, being detained in their ſeats by the entertainment of the games, and the pores of their bodies being opened by the inactive pleaſure, readily imbibe the air; which, if it comes from fens, or other noxious places, breeds hurtful humours in the body; but if the place of the theatre is choſen with due care, ſuch evils will be prevented The intenſe heat of the meridian muſt alſo be guarded againſt; for when the ſun fills the compaſs of the theatre, the air being confined therein, and prevented from circulating, becomes aduſt and fervid, extracting and diminiſhing the juices of the body: ſo that thoſe dangerous expoſitions are to be carefully avoided.

Fig. XXXVI. IF the foundation happens to be on a hill, the work will be more eaſily done. But if neceſſity obliges it to be erected in a plain, or in a marſhy place, the piling and ſubſtructure muſt be executed in the manner deſcribed in the third book for the foundations of temples. Upon the foundation, the degrees (a) are raiſed with ſtone and marble. The precinctions (b) are made proportional to the heighth of the theatre, and are no higher than the paſſage of the precinction is broad; for, if they are higher, they reflect and obſtruct the voice from riſing to the upper parts, not permitting the terminations and exact ſignifications of the words to reach the ears of ſuch of the audience as are ſeated

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(1*) The degrees are the ſeats of the theatres, raiſed in form of ſteps, one above another.

(2*) The precinctions are the paſſages or landing places between the ranges of ſeats, as b b, Fig. XXXVI. Vitruvius ſays they ſhould be no higher than broad; but it is remarked by all the tranſlators in general, that they cannot be of equal heighth and breadth; for as Vitruvius gives the degrees a proportion of about twice their heighth in breadth, and ſays a ſtraight line, c d, ſhould touch all their edges, from top to bottom, the precinctions muſt conſequently have the ſame proportion as the degrees. This will certainly be the caſe, if the floor of the precinction is ſuppoſed to be on a level with the adjoining degree (e); but if the floor of the precinction is ſunk a little below that degree, as it ſeems proper it ſhould be, in order that thoſe who paſs to and fro, in the precinction, may not tread on thoſe who are there ſeated; then the precinction may have the proportion Vitruvius deſcribes; for, if the floor of the precinction, b f, is ſunk ſo much below the ſaid degree as is equal to the heighth of one degree, and the clear breadth of the precinction is made equal to the breadth of two degrees, it will happen that the paſſage of the precinction, b f, will be exactly equal to its heighth, f g, on the ſuppoſition that the degrees are made exactly twice as broad as high. With regard to proportioning the precinctions to the heighth of the theatre, as Vitruvius mentions, I imagine it is to be underſtood to allude to their number, which is neceſſary to be greater in large and high theatres than in ſmaller, for it cannot allude to their magnitude, which is neceſſarily fixed in all theatres by the limited meaſure of the degrees.

above the precinctions. It is alſo to be ſo contrived that a line (c d) being extended from the lowermoſt to the uppermoſt degree, may touch the edges and angles of all the degrees from top to bottom, ſo that the voice may not be impeded.

The entrances ſhould be numerous and ſpacious, the ſuperior not connected with the inferior, but to all parts made direct, uninterrupted, and without intricacy, that, when the people are diſmiſſed from the ſhews, they may not be crouded in departing; but have, from all parts, a ſeparate and unobſtructed egreſs.[3*]

It is alſo carefully to be obſerved, that it be not a place that ſtifles the ſound, but ſuch wherein the voice may freely expand. This will be effected, if a ſituation where there is no impediment to reſonance is choſen; for the voice is flowing breath, and becomes ſenſible by the percuſſion of the air, which it actuates in an infinite number of circles; in like manner as in ſtanding water, when a ſtone is caſt therein, innumerable circles of waves ariſe from the center, and expand to a great breadth, unleſs they are interrupted by the narrowneſs of the place, or ſome obſtacle ſuffers not the impreſſion of the waves to arrive at the end; for when they are interrupted by obſtacles, the firſt recoiling diſturbs the impreſſions of the ſucceeding. Upon the ſame principle the voice acts, and cauſes ſuch circular motions in the air; but in water the circles move only ſuperficially in a level plane; whereas, in air the voice not only expands ſuperficially, but alſo aſcends gradually in heighth. As therefore in the impreſſions of the waves in water, ſo is it in the voice, when no obſtacle impedes the firſt, neither the ſecond nor the enſuing are interrupted; but all, without reverberating, reach the audience, from the loweſt to the higheſt parts.

The ancient architects therefore, following nature, and conſidering the aſcending property of the voice, thus eſtabliſhed the degrees of theatres, and contrived, by the ptinciples of mathematics and muſic, that howſoever the voice might be on the ſcene, it ſhould nevertheleſs arrive clear and melodious to the ears of the audience. For as, by inſtruments of braſs or horn, the ſounds of the chords and dieſes are rendered clearer, ſo the ancients contrived to ſtrengthen the voice by the harmonic conſtruction of the theatres.

(3*) Vitruvius gives us no farther information concerning the ſtair-caſes and paſſages, that led to the ſeveral ſtories or parts of the theatre, nor of its external conſtruction. I have, therefore, ſupplied this deficiency from the remains of the theatre of Marcellus at Rome; which, as being one of the moſt celebrated theatres of the ancients, built, and ſubſiſting in perfection, at the time of Vitruvius, I have choſen as my model; copying from thence whatever does not oppoſe the inſtructions of Vitruvius; and in this I have followed Piraneſi, who ſeems to have meaſured the ruins himſelf. The plan given by Deſgodetz, being evidently falſe, he not having meaſured it himſelf, but copied it from a plan ſaid to have been taken by Baldeſari, the architect, who built the palace at preſent ſtanding on the ruins of that theatre: Serlio has alſo copied the ſame plan; which is ſo erroneous, that, even in the number of piers and arches that ſurrounded the theatre, and which may at preſent be eaſily diſcovered, it is not conformable to the original.

CHAPTER IV.

Of Harmony.

HARMONY, or the ſcience of muſic, is obſcure and difficult, eſpecially to thoſe who are unacquainted with the Greek language; for, in explaining it, it is neceſſary to make uſe of the Greek terms; becauſe ſome of them have no Latin appellations. I ſhall, therefore, as intelligibly as I am able, make ſome tranſlations from the writings of Ariſtoxenes, and ſubjoin his diagram and intervals of ſounds, that thoſe who will attentively peruſe it may underſtand it more eaſily. 1*

(1*) In order to render this chapter more intelligible, it is neceſſary to give a ſhort account of the ancient muſic, referring the reader to the diagram, fig. XXXVIII, to facilitate the conception thereof.

The ancients had eighteen notes or tones, which were contained within two octaves; but they divided their ſcale or diagram of notes, into tetrachords, or half octaves, being ſyſtems of four notes each. Tetrachords were either conjunct or disjunct. Conjunct when the higheſt note of the preceding tetrachord was the loweſt note of the ſucceeding tetrachord, making but ſeven notes in the two tetrachords. But, as in this caſe a note was wanting to complete the octave, they were obliged to add a note below the firſt tetrachord, to make the full octave or eighth, which additional note they called proſlambanomenos. Tetrachords were disjunct, when the loweſt note of the ſucceeding tetrachord was one tone diſtant from the higheſt note of the preceding tetrachord; thereby making the octave complete.

Originally, the two octaves contained no more than four tetrachords; but the ancients, afterward finding that the third tetrachord was imperfect, and that its firſt note, parameſe, did not agree in fourths with the parhypate of the ſecond tetrachord, owing to its being a disjunct tetrachord, and conſequently a full tone being between the meſe and parameſe, they were obliged to contrive another third tetrachord, which ſhould be conjunct, or a tone lower than the former, to be made uſe of occaſionally, when the harmony required it. For this reaſon, we find two tetrachords; viz. ſynemmenon and diezeugmenon, intermixed together at the beginning of the ſecond octave. The names of the tetrachords are, hypaton, or the firſt; meſon, or the middle; ſynemmenon, or the conjunct; diezeugmenon, or the disjunct; and hyperbolœon, or the higheſt: the notes or names of the tones, in the firſt tetrachord (previouſly naming proſlambanomenos) are hypate hypaton, parhypate hypaton, and lichanos hypaton. In the ſecond tetrachord, hypate meſon, parhypate meſon, lichanos meſon, and meſe. In the third tetrachord, trite ſynemmenon, paranete ſynemmenon, and nete ſynemmenon. In the fourth tetrachord, parameſe, trite diezeugmenon, paranete diezeugmenon, and nete diezeugmenon. In the fifth tetrachord, trite hyperbolœon, paranete hyperbolœon, and nete hyperbolœon.

Of theſe eighteen notes, the eight which began and ended the ſeveral tetrachords where fixed, and invariable, like our fundamental, fourth, fifth, and their octaves. The other ten, were moveable, as are our ſecond, third, ſixth, ſeventh, and their octaves. From the variation of theſe ten notes, aroſe the three ſpecies of muſic, which the ancients called enharmonic, chromatic, and diatonic; and the different colours (as they called them) of each of thoſe ſpecies.

The intervals forming each tetrachord in theſe three ſpecies, and their reſpective colours, are as follows: the enharmonic tetrachord had but one colour; it was formed by a dieſis (that is a quarter of a tone) then another ſuch dieſis, and laſtly a ditone, (*i. e.* a double tone.)

The chromatic tetrachord had three colours; molle, ſeſcuplum, and toncœum; the molle was formed by a triental dieſis (*i. e.* a third part of a tone) then another ſuch dieſis, and laſtly a trihemitone (or tone and half.)

The ſeſcuplum roſe by a ſeſquialter dieſis (*i. e.* $4\frac{1}{12}$ of a tone) then ſuch another dieſis; and laſtly, a tone and three quarters.

The toneum, by a hemitone, then another hemitone, and laſtly a trihemitone, and this laſt is the common chromatic.

The diatonic had two colours, molle and ſyntonum. The molle roſe, by a hemitone, three quadrantal dieſis, and five ſuch dieſes.

The ſyntonum by a hemitone, a tone and another tone; and this laſt is the common diatonic, ſo that every tetrachord was compoſed of two tones and half, though differently diſtributed and divided.

In the diagram, Fig. XXXVIII, I have ſhewn the ſeveral intervals, or tones, in each ſpecies, with their relation to the modern intervals and notes; but, as Vitruvius makes no mention of the different colours, I have alſo omitted them, giving only the intervals of the common diatonic, chromatic, and enharmonic, the former of which are the ſame as now uſed by the moderns.

When the voice is modified in variations, it is made either more ſhrill, or more baſs, and may be moved in two manners; of which, one is continued, the other detached. The continued voice reſts neither at the limits of the tones, nor at any other part, rendering the terminations imperceptible, although the middle of the intervals are very obvious; as when, in diſcourſe, we ſay ſol, lux, flos, nox; for in theſe neither the beginning or ends of the variations of the voice are perceptible, and it is not ſenſible to the ears where it changes from baſs to ſhrill, or from ſhrill to baſs. But in the detached it is otherwiſe; for here the voice, in varying, reſts on the limits of ſome ſounds, then on others, and makes frequent and ſenſible variations to and fro; as by the changes of the voice in ſinging, we make a variety in the modulation. When, therefore, theſe tones are changed, the points where they begin and end are made obvious by the evident diſtances of the ſounds; whilſt the others are plain in the middle only, and their limits indiſtinct.

There are three ſpecies of modulation. The firſt, that which the Greeks name *armonian*, the ſecond *chroma*, and the third *diatonon*. The harmonic modulation is the product of art. This muſic is chiefly baſs, and is much eſteemed. The chromatic, being acute and briſk in its modulation, is more ſweet and pleaſing; but the diatonic, being natural, is more eaſy in the diſtances of its intervals.

In theſe three ſpecies the tetrachords are differently divided. The harmonic tetrachords have of tones and dieſes two of each. A dieſis is a quarter part of a tone, ſo that a hemitone contains two dieſes. The chromatic are compoſed of two hemitones in ſucceſſion, and a third interval of a trihemitone. The diatonic have two ſucceſſive tones, and the third is a hemitone,* which terminates the meaſure of the tetrachord. Thus the tetrachords in all the three ſpecies are equally conſtituted of two tones and a hemitone; but each kind being ſeparately conſidered, every one is found to have a different diſpoſition of the intervals. Nature then has divided the ſound of the voice into the intervals of tones, hemitones, and tetrachords, and fixed their bounds, the quantity of the intervals, and the certain diſtances which conſtitute their quality. This therefore the artificers, who make inſtruments of muſic, obſerving and practiſing, as nature has eſtabliſhed, by that means give their works the proper accordance and perfection.

Tones, which by the Greeks are called *phthongoi*, are in each ſpecies eighteen; of which eight in each ſpecies are immutable and permanent; and the remaining ten, according to the uſual modulation, are moveable. The permanent are thoſe which being diſpoſed between the variable, preſerve the connection of the tetrachords, and which, in the ſeveral ſpecies, have their limits fixed. They are thus named: proſlambanonenos, hypate hypaton,

(2*) Vitruvius mentions the hemitone, as following the two tones in the diatonic tetrachord; whereas it is generally underſtood to be before them. See the ſucceeding notes.

hypate meſon, meſe, nete ſynemmenon, parameſe, nete diezeugmenon, and nete hyperbolæon. The moveable are thoſe which are diſpoſed in the tetrachords, between the permanent, and vary their places according to the ſpecies. They have theſe names: parhypate hypaton, lichanos hypaton, parhypate meſon, lichanos meſon, trite ſynemmenon, paranete ſynemmenon, trite diezeugmenon, paranete diezeugmenon, trite hyperbolæon, and paranete hyperbolæon.

THOSE which are moveable have alſo other properties, for their intervals and diſtances are augmentable; thus, parhypate, which, in the harmonic ſpecies, is only a dieſis diſtant from hypate, in the chromatic is encreaſed to a hemitone, and, in the diatonic, to a tone[3*]; alſo, that note which is called lichanos, in the harmonic ſpecies, is a hemitone diſtant from hypate, but, in the chromatic it is augmented to two hemitones, and in the diatonic to three hemitones diſtant from hypate. Thus theſe ten ſounds, by means of their tranſitions in the different ſpecies, produce a threefold variety in the modulation.

THERE are five tetrachords: the firſt is the baſeſt, which, by the Greeks, is called *hypaton*; the ſecond is the mean, which is called *meſon*; the third is the conjoined, called *ſynemmenon*; the fourth is the disjoined, called *diezeugmenon*; the fifth, becauſe it is the moſt acute, is called by the Greeks *hyperbolaion*.

THE concords which the human voice can naturally modulate, and which, by the Greeks are called ſymphoniai, are ſix; diateſſaron, diapente, diapaſon, diapaſon with diateſſaron, diapaſon with diapente, and diſdiapaſon, which receive their names from number; for the voice being firſt fixed on one given interval of ſound, then varying when it arrives at the fourth interval from thence, it is called diateſſaron; the fifth is called diapente; the eighth, diapaſon;

(3*) Here we find parhypate, in the diatonic tetrachord, deſcribed to be a tone diſtant from hypate. This is uſually explained to be but an hemitone diſtant; wherefore Meibonius, with Perault, and Galiani, following him, have ſuppoſed the text to be corrupted by the copyiſts; and that inſtead of *diatono vero tonum—diatono hemitonium* ſhould be read; to which latter Galiani has altered the text. I have, however, choſe to adhere to the uſual reading; and, with ſome remarks thereon, thus leave it to the ſenſe of the reader.

Vitruvius's intention is evidently to give an example of the augmentation or progreſſion of the ſame note in the three different ſpecies of muſic; it may therefore be reaſonably ſuppoſed that, if this progreſſion had not exiſted in the note, he has choſen to exemplify it by, he would not have choſen it for his example; but his choice of it is a full evidence that this note had ſuch progreſſion in his underſtanding, and abſolutely forbids a ſuppoſition of its being an error of the copyiſts; we ſee alſo that the note lichanos, which he next inſtances, perfectly agrees in this progreſſional increaſe.

It cannot then be an error of the copyiſts; and I am inclined to believe it is no error at all; but am rather of opinion that the parhypate of the diatonic tetrachord was variable in place, being ſometimes a hemitone, and ſometimes a tone, diſtant from hypate, correſponding to our C natural and C ſharp; by that means (with the other proper changes) making the key of the muſic ſometimes flat and ſometimes ſharp. According to the commonly received diſpoſition of the ancient notes, the diatonic muſic muſt have always been in the flat key; but I cannot conceive any reaſon why we may not ſuppoſe the ſharp key to have been in uſe with the ancients as well as with us; for we find the voice fixes on the intervals of the ſharp key rather more eaſily and naturally than on thoſe of the flat.

I am, therefore, of opinion, that the text is pure, or at leaſt doubtful; and, for that reaſon, Galiani ought not to have ſo haſtily admitted an alteration.

the eighth, and half the eighth, diapaſon with diateſſaron; the ninth, and half the ninth, diapaſon with diapente; and the fifteenth diſdiapaſon: for, with the intervals of the third,(4*) the ſixth, or the ſeventh, either by the ſound of ſtrings, or by that of the voice, no concord can be made; but diateſſaron, diapente, and the reſt, in order as above written, up to diſdiapaſon, have their intervals of ſound naturally agreeable and concordant. Theſe concords are generated by the union of ſounds, which are called by the Greeks *phthongoi.*

CHAPTER V.

Of the Vaſes of the Theatres.

BY means of theſe inveſtigations, the brazen vaſes, which are uſed on account of the magnitude of theatres, may be made. Theſe are ſo formed, that, upon being ſtruck, they ſound in themſelves diateſſaron, diapente, and ſo in order to diſdiapaſon. After which they are diſpoſed according to the laws of muſic, in cells formed within the ſeats of the theatres, in ſuch a manner as not to touch the wall, and have a vacancy all round them to the top of the cell. They are ſituated inverſely, and, on the ſide which is turned toward the ſcene, they are ſupported by wedges not leſs than half a foot high; alſo, oppoſite to theſe cells, in the beds of the lower ſeats, apertures are left, two feet long, and half a foot high.

Fig. XXXIX. THE diſpoſition of theſe vaſes is thus explained: If the theatre is not of a great magnitude, the range of the vaſes is fixed at the middle of its heighth, and therein are formed thirteen cells, for the twelve equal diſtances of the intervals. Then thoſe vaſes which ſound nete hyperbolœon, as before written, are firſt placed in the cells which are at the extremity of either horn. In the ſecond cells from either extremity is placed the diateſſaron (of the former) nete diezeugmenon; in the third the diateſſaron, nete parameſon(1*);

(4*) It may not be wholly uſeleſs to mention a conjecture concerning the reaſon why the ancients did not allow the third to be a concord. They began their firſt tetrachord at that note which is called by the moderns the ſecond; viz. B. fig. XXXVIII, for they did not reckon proſlambanomenos as any part of the ſcale, conſequently our ſecond was their firſt, and our fourth their third, ſo that their third was made by the interval between our ſecond and fourth. Now, between the ſecond and fourth, there is only a hemitone major and a tone minor, which makes a defective third; for, to form a perfect natural third, a tone major and and a hemitone major is required, and then it has the proportion of five to ſix, in which only its concordance and harmony conſiſts; as therefore the ancient third wanted this proportion, it conſequently could not harmonize, or ſound concordant.

(1*) This is to be underſtood parameſe only, that note being the diateſſaron, or fourth to nete diezugmenon, as fig XXXVIII. ſhews.

in the fourth the diateſſaron, nete ſynemmenon; in the fifth, the diateſſaron, meſe; in the ſixth, the diateſſaron, hypate meſon; and in the middle one, the diateſſaron, hypate hypaton. By this regulation, the voice from the ſcene, as from a center, diverging itſelf around, and ſtriking the cavities of the ſeveral vaſes, is made more ſonorous and clear by their correſponding conſonance.

But if the theatre is of an ample magnitude, then the heighth is divided into four parts, that there may be made three ranges of cells, one for the harmonic, another for the chromatic, and the third for the diatonic. The harmonic is firſt diſpoſed at bottom, in the ſame order as deſcribed above for the leſſer theatre. In the middle range, the vaſes, which have the ſound of the chromatic hyperbolæon are firſt placed at the extremity of the horns; in the ſecond cells, the diateſſaron from this, the chromatic diezeugmenon; in the third the diateſſeron, the chromatic ſynemmenon; in the fourth the diateſſaron, the chromatic meſon; in the fifth, the diateſſaron, the chromatic hypaton; and in the ſixth, the parameſe; becauſe this laſt has a common accordance with the chromatic hyperbolæon, as the diapente; and with the chromatic meſon, as the diateſſaron. In the middle no vaſe is placed, becauſe no other tones in the chromatic ſpecies of muſic can be concordant.

Fig. XL.

(2*) Nete ſynemmenon cannot be the fourth, or diateſſaron of parameſe; this, ſeveral of the tranſlators have noticed. Meibonious and Perault have ſuppoſed it to be an error, and that diapente ſhould be read inſtead of diateſſaron, ſuppoſing it was meant to be the fifth, or diapente of the hyperbolæon; but Galiani has rectified their miſtake, by ſuppoſing that Vitruvius ſpeaks of it as the diateſſaron of the ſucceeding tone (viz. meſe) and not of the preceding tone, parameſe; the reader will alſo obſerve, by referring to fig. XXXVIII, that the notes mentioned are the terminating notes of the ſeveral tetrachords; of which, nete ſynemmenon was one.

The terminating notes of the ſeveral adjoining tetrachords were diateſſarons, or fourths, to each other, except in the tetrachords, ſynemmenon, and diezeugmenon, which were never uſed together in ſinging; it was nevertheleſs neceſſary to have both thoſe tetrachords, becauſe the melody, as well as harmony of the muſic, ſometimes required their aſſiſtance (as I have remarked in the foregoing account of ancient muſic) and the actor directed his voice to the one or the other, according to the tone required.

(3*) Vitruvius, in this caſe, names only the tetrachords, not the particular notes; but, as he ſays, parameſe is diapente, or fifth to hyperbolæon, and diateſſaron, or fourth to meſon, we may eaſily diſcover the particular notes; for the diateſſaron to parameſe muſt be lichanos meſon, and the diapente muſt be paranete hyperbolæon, not trite hyperbolæon, as Galiani has concluded; for a perfect fifth muſt have ſeven hemitone intervals; whereas between parameſe and trite hyperbolæon there are but ſix. This being ſettled, the ſeveral notes will be the following: Iſt, paranete hyperbolæon; IInd, paranete diezeugmenon; IIId, paranete ſynemenon (which is the ſame as parameſe;) IVth, lichanos meſon; Vth, lichanos hypaton; VIth, parameſe. This is ſhewn by Fig. XL. and alſo Fig. XXXVIII, where the notes uſed are marked with V.

It may be obſerved, that as the terminating notes of each tetrachord were before named, ſo here the upper notes, next to the terminating notes in each tetrachord, are made uſe of: and between the two tetrachords, ſynemmenon and diezeugmenon, there is only a tone difference, as in the former caſe; although they are mentioned as diateſſarons to one another, which has been accounted for in the foregoing note. In the following diatonic range alſo, the tetrachords only are mentioned; we, however, diſcover by the ſame means the particular notes; which prove to be the upper notes of the ſeveral tetrachords, as in the foregoing caſe; and they are in the ſame order, excepting that proſlambanomenos is uſed in the place of parameſe, and meſe is placed in the middle cell, which is entirely vacant in the former range.

Fig. XLI. In the upper diviſion, or range of cells, the vaſes formed to ſound the diatonic hyperboleon, are placed in the firſt cells at the horns; in the ſecond cells, the diateſſaron, the diatonic diezeugmenon; in the third, the diateſſaron, the diatonic ſynemmenon; in the fourth, the diateſſeron, the diatonic meſon; in the fifth, the diateſſaron, the diatonic hypaton; in the ſixth, the diateſſaron, the proſlambanomenos; and in the middle, the meſe, becauſe this laſt has a common concordance with the proſlambanomenos, as the diapaſon; and with the diatonic hypaton, as the diapente. But whoſoever deſires more perfectly to underſtand this ſubject, may attend to the diagram at the end of the book, formed according to the principles of muſic, and which was left by Ariſtoxenus, who, with great ingenuity and induſtry, eſtabliſhed the proportional intervals of the tones. Thoſe therefore who ſtudy theſe principles, the nature of ſounds, and the cauſe of their pleaſing effects on the hearers, will be more capable of erecting theatres with due perfection.

Some may alledge, that many theatres are built in Rome every year, without any of theſe contrivances being uſed therein; but the reaſon is this: all the public wooden theatres have many boarded ſurfaces, which are neceſſarily ſonorous. This is made evident by the ſingers, who, when they would raiſe a ſtrong tone, turn themſelves to the doors of the ſcene, and by their reſonance receive a help to their voice. But when the theatres are conſtructed of ſolid ſubſtances, that is, of ſtone or marble, then the methods here explained become of uſe. If it is demanded in what theatres they are made uſe of, Rome cannot ſhew any; but the provinces of Italy, and many cities of Greece, can ſhew them. We know alſo that Lucius Mummius, who deſtroyed the theatre of Corinth, brought to Rome the vaſes of braſs, and dedicated the ſpoils in the temple of Luna. Likewiſe, many ingenious architects, who conſtruct theatres in ſmall towns, to ſave expence, make uſe of earthen veſſels to help the ſound, which, being adjuſted according to theſe rules, anſwer the intended purpoſe.

CHAPTER VI.

Of the Form of Theatres.

Fig. XXXVI. THE form of theatres is thus regulated. The central point being fixed in the middle (A,) a circle (B H) is drawn as large as the circumference of the bottom is intended; and therein, four triangles of equal ſides and intervals, are

(1*) Vitruvius does not ſay whether he means the bottom of the external or of the internal part of the theatre; but the circumſtances of the deſcription, and his making no mention of the outward conſtruction of the theatre, make it moſt probable that he means the bottom of the internal part, or orcheſtra, B H, B H.

deſcribed[2*]; whoſe extremities touch the ſurrounding line of the circle: this, by the analogy of aſtronomy to muſic, is alſo the method uſed in the deſcription of the twelve celeſtial conſtellations.

Of theſe triangles, that whoſe ſide (D D) is toward the ſcene, at the part where it interſects the curve of the circle, there determines the front of the ſcene[3*], and a line (H H) being drawn through the center (A) parallel thereto, ſeparates the pulpit[4*] (E) of the proſcene from the orcheſtra (F;) ſo that the pulpit becomes broader than that of the Greeks; for, (in the Roman theatres) all the performers act on the ſcene (or ſtage) and the orcheſtra is aſſigned for the ſeats of the ſenators[5*]. The heighth of the pulpit is no more than five feet, that thoſe who ſit in the orcheſtra may ſee the performance of all that is repreſented.

The cunei[6*] (K) of the ſpectatory of the theatre, are ſo diſpoſed, that the points of the triangles, which touch the circumference of the circle, determine the places of the aſcents and ſteps (G) between the cunei, up to the firſt precinction (b); and above that, by the alternacy of the aſcents, they alſo indicate the middle of the upper cunei (L). The angles, which direct the place of the lower ſteps, are in number ſeven; the remaining five determine the diſpoſition of the ſcene. Oppoſite to the middle one (B) ſhould be the regal doors (N); thoſe which are on the right and left (C) fix the diſpoſition of the hoſpitalian doors[7*]; and the extreme two regard the entrances of the returns (I).

(2*) This divides the circle into twelve points, by which the diſpoſition of the ſteps and paſſages are governed. The theatre of Marcellus appears to have been diſpoſed by ſixteen points; and the ſenators paſſages, Z Z, which led into the orcheſtra, were placed oppoſite to each point, excepting that they were all ſhifted out of that ſituation, half the breadth of a paſſage, from the horns, H, towards the middle, B, in order to gain a paſſage at the horns, within the limits of the ſemi circle.

(3*) This determines the place of the front of the ſcene to be a quarter of the diameter of the orcheſtra diſtant from the ſaid orcheſtra.

(4*) The pulpit was the ſtage. The proſcene was the ſpace before the ſcene, between that and the orcheſtra, and on which the pulpit or ſtage was raiſed.

(5*) Upon comparing the figures XXXVI and XXXVII, it will be ſeen how much the pulpit or ſtage of the Roman theatres was broader than that of the Greeks; for it was the cuſtom of the Greeks to have their dancers, &c. perform in the orcheſtra, and the pulpit was reſerved for the action of the drama only; whereas, with the Romans, the whole was performed on the pulpit, and the orcheſtra was occupied by the ſeats of the ſenators.

From the orcheſtra to the firſt precinction (b) was generally made fourteen rows of ſeats, which were allotted for the equeſtrian order, tribunes, &c. all above that were the ſeats of the plebeians; and the women were, by Auguſtus, appointed to ſit in the gallery or portico (k) above.

(6*) The ſeats of the theatres were divided at regular diſtances by the ſteps, G M, in radial lines, ſo that the ſeveral collections of ſeats were in the form of wedges, broader at the top than at bottom; from whence they were called cunei, or wedges. Maffei, in his treatiſe of amphitheatres, aſſerts that the ſteps were not directed in radial lines, but in diagonals, making the baſe line of the wedge alternately at top and bottom; but as that oblique direction muſt be inconvenient, and as there is no particular reaſon for ſuppoſing ſuch an inconvenient diſpoſition, the former opinion is rather to be preferred.

The ſpectatory is that part of the theatre where the ſpectators ſat.

(7*) The ſcene was built in imitation of the fronts of the Greek houſes, in which the maſters apartments were diſpoſed in the middle, and the apartments on either ſide were allotted for the reception of ſtrangers; hence the doors on the right and left of the middle one were called the hoſpitalian doors.

The degrees (a) of the spectatory, whereon the feats[8*] are laid, should be in heighth not less than a foot and a palm, nor more than a foot and six digits[9*]; their breadth should not be more than two feet and an half, nor less than two feet.

CHAPTER VII.

Of the Porticus and other Parts of the Theatre.

THE roof (m) of the porticus (k) which is on the highest degree, is to be level with the top of the scene; for the voice ascending regularly to the uppermost degrees and roof, will, if the top is not all on a level, be lost at the summit of that part whose altitude is least, and to which it first arrives.

Whatever may be the diameter (H H) of the orchestra[1*], which is encompassed

(8*) We learn from passages in sundry authors, that the ancients used to lay coverings of wood, or cushions, &c. on the stone seats of the theatres; and these words of Vitruvius, *Gradus spectaculorum ubi subsellia componantur (the degrees where the subsellia or seats are laid*, seem to intimate the same; the word subsellia signifies some kind of seats, and cannot mean the degrees, or stone seats themselves, because it is said they are laid on the degrees; it is therefore probable that by that word Vitruvius means the coverings of boards, cushions, &c. which were laid on the stone degrees. Perault remarks, that Dion Cassius had overlooked this passage of Vitruvius, when he asserted that such coverings were not laid on the degrees of theatres, before the time of Caligula; adding, that, as Vitruvius wrote in the time of Augustus, they must have been used in his time; but this is taking it for granted, that Vitruvius wrote in the time of Augustus; that not being certain, these words of Dion Cassius become an argument in favour of the opinion that Vitruvius did not write at that time, nor till after the time of Caligula, in whose reign Dion Cassius wrote. See the Remarks on the Life of Vitruvius.

(9*) A palm is a quarter of a foot: it has before been observed that the ancient Roman foot was 11 inches $\frac{6}{10}$ of our foot, and was divided into sixteen digits; the heighth therefore of the degrees was not less than about a foot and a quarter, nor more than a foot and three eighths. In the theatre of Marcellus, the degrees were in heighth half their breadth; which proportion I have chosen to follow in my draught. fig. XXXVI, making the degrees one foot and a quarter high, and two feet and a half broad.

(1*) Vitruvius gives us no directions concerning the proportion of the orchestra to the whole building, that depending on the number of degrees disposed around the orchestra, which might be determinate; it must, however, be supposed that so great a number were not disposed around small orchestras as around larger, and that some bounds were observed. The orchestra of the theatre of Pola, given by Serlio, and which subsisted at the time he measured it, was, in diameter, one third of that of the whole building; and, in a theatre represented in the fragments of the plan of Rome, now preserved in the Capitol, the diameter of the orchestra is nearly of the same proportion.

In the theatre of Marcellus, it was as four is to eleven, or thereabout. Barbaro, Perault, and Galiani, following each other, have, in their draughts, made it nearly as one to two, which is more than it is found in any ancient theatre, and is productive of many inconsistencies, as will be hereafter shewn. I have chosen the proportion of that of the theatre of Marcellus. Perault, and Galiani, would persuade us that Vitruvius means the *semi-diameter* of the orchestra, where he mentions the *diameter*; because the sixth part of the diameter, which he gives to the heighth of the entrances (as they understand the word *itinerum*) into the orchestra, is, in their opinion, too great. But, notwithstanding the reasoning of Perault, I cannot so easily assent to a deviation from the express words of the text. It may as well be supposed that Vitruvius means semi-diameter, where he writes diameter in the description of the round temples, and in all other parts of his work. Perault, with an intent to prove that Vitruvius means the *semi-diameter*, and not the *diameter*, brings, as an argument, a passage from Pliny, who says, *that the theatre of M. Scaurus was one of the largest ever built, and that the lower columns of the scene of this theatre was 42 feet high.* Vitruvius, in the next paragraph, says, *such lower columns should be in heighth the fourth part of the diameter of the orchestra; according to this rule, therefore, the diameter*

by the loweſt degree, the ſixth part thereof is taken; and at the horns (H) and around the paſſage,[2*] with this meaſure (i p) ſet perpendicular, the lower ſeats are marked;[3*] and where

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of the orcheſtra of the ſaid theatre muſt have been 168 *feet. The orcheſtra of the theatre of Marcellus was* 180 *feet French. Perault then argues, that, at this rate, the theatre of Scaurus was leſs than that of Marcellus; whereas Pliny ſays, that of Scaurus was one of the largeſt ever built; but, continues he, if it is admitted that Vitruvius means ſemi-diameter, then the orcheſtra of Scaurus muſt have been in diameter eight times the heighth of thoſe columns; that is* 236 *feet;* 56 *feet larger than that of Marcellus; and thus it will better agree with the words of Pliny.*

In this calculation, Perault has made a miſtake of 100 feet; for 8 times 42 is 336, inſtead of 236, as he writes; conſequently the diameter of the orcheſtra of Scaurus was 156 feet larger than that of Marcellus; an enormous width greater than any of the few remains of theatres that have reached us will authorize, and even exceeding the internal area of the Colliſeo in its longeſt diameter (which is but 218 ½ feet, Veroneſe). The theatre of Pola, meaſured by Serlio, was one hundred and thirty feet, and another near Viterbo, one hundred and forty-one feet and an half.

But the words of Pliny will not authorize ſuch a conſtruction as Perault gives them. Pliny ſays the theatre of Scaurus was one of the largeſt ever built; from whence it does not follow that it was larger than the theatre of Marcellus; which alſo was one of the largeſt ever built, and may have been larger than that of Scaurus, without contradicting the words of Pliny.

Suppoſing then, of theſe two large theatres, that of Scaurus to have been the ſmaller, the words of Vitruvius (allowing him to mean what he ſays) will be found to agree, and the orcheſtra of Scaurus, according to this rule, muſt have been 168 feet, which is but 12 feet (or a fifteenth part) leſs than that of Marcellus; a meaſure more probable, and approaching nearer to the dimenſions of other ancient theatres.

Thus the argument of Perault turns againſt himſelf, and greatly contributes to prove that Vitruvius means the full diameter (as he writes), and not the ſemi-diameter of the orcheſtra.

(2*) This path or paſſage, around which the lower ſeats are ſaid to be marked, muſt undoubtedly be a paſſage round the back, or ſemi-circular part of the orcheſtra, H B O; for no other place can be eaſily imagined about which the lower ſeats may be marked; and ſuch a paſſage muſt have been very neceſſary, and almoſt indiſpenſible, in order to give free acceſs to the ſeveral ſeats in the orcheſtra.

(3*) Theſe lower ſeats which are marked, muſt conſequently be as high as the meaſure by which they are marked. But whether by the words *inferiores ſedes, the lower ſeats*, we are to underſtand two, three, or more of the lower degrees, or the loweſt degree only, as containing the lower order of ſeats, is a doubt: Perault and Galiani have underſtood it in the former ſenſe, becauſe they think the loweſt degree would, in the latter caſe, be too much elevated above the floor of the orcheſtra.

But, wherever Vitruvius means the degrees, he uſes the word *gradi*; whereas he here uſes the word *ſedes*; from whence it may be ſuppoſed that he expreſſes by that word the ſeveral ſingle ſeats contained in one degree. Alſo, as he directs theſe ſeats to be marked around the paſſage at the back of the orcheſtra, which adjoins to the loweſt degree, it is moſt natural and rational to ſuppoſe, that it is that loweſt degree which he means to be marked, and not the degrees above, which are at a conſiderable diſtance from that paſſage, and which could not be eaſily reached from thence.

The only foundation for the opinion of Perault and Galiani (who imagine that, by this mark, the heighth of the ſenators entrances are determined) is their own opinion, that, if the heighth of the loweſt degree was to be underſtood to be determined thereby, that ſuch degree would be too much elevated. But, as we know not the exact formation of the ancient theatres in this reſpect, or the neceſſity there might have been for this great elevation, ſuch opinion is not to be held in competition with the probabilities on the other ſide the queſtion, ariſing from the words of the text: it is very probable, nay even neceſſary, that the floor of the orcheſtra (i i) ſhould have been raiſed as it receded from the ſtage, that thoſe who ſat behind might ſee over the heads of thoſe who ſat before; the more it was raiſed the more convenient it would have been in this reſpect. The degrees were inclined in an angle of 22 ½; and if the floor of the orcheſtra had been raiſed to a third of that inclination (*i. e.* in an angle of 7 ½) it would not have been more than convenience required. In ſuch caſe, the loweſt degree, ſuppoſing it to have the fore-mentioned elevation, would have been but the twelfth part of the diameter of the orcheſtra above the higheſt part of the floor of the orcheſtra, which would have been no more than ſufficient to prevent the populace in the degrees from forcing into the orcheſtra among the ſenators. For theſe reaſons, therefore, the loweſt degree ought to have been conſiderably elevated; and that elevation ſhould have been always proportional to, and dependant on, the diameter of the orcheſtra, that the ſituation of the ſpectators might have been properly adapted to their diſtance from the ſtage; but the heighth of the entrances is no ways connected, or related to the diameter of the orcheſtra, and is of no conſequence to the conveniencies or appearance of the theatre. I am therefore of opinion that it is the loweſt degree which Vitruvius means ſhould be raiſed above the orcheſtra the ſixth part of its diameter.

the mark happens, there the ſuperciliæ of the paſſages are made[4*]; for thus they will have a ſufficient elevation.

THE length (I I) of the ſcene ſhould be made double the diameter of the orcheſtra.[5*] The height of the podium (r) from the level of the pulpit, is the twelfth part of the diameter of

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Perault objects, that, by ſuch an elevation of the loweſt degree, the dancers who performed in the orcheſtra of the Greek theatres would have been in a great meaſure unſeen; but Vitruvius does not here treat of the Greek theatres; he is ſpeaking of the Roman. Vitruvius ſays, *the Greek theatres are in many reſpects different*; and, though he does not mention this circumſtance as one of the differences, yet they muſt certainly have been different in this part; for, as the ſenators ſat in the Roman orcheſtra, it muſt have been in ſome degree inclined (as before ſaid); but the Greek orchethra, being for the uſe of the dancers, it muſt have been level; therefore, there not being the ſame reaſons for ſo great an elevation of the loweſt degree in Greek theatres, it was probably fixed no higher from the level floor of their orcheſtra than it was from the higheſt part of the inclined orcheſtra in the Roman theatres.

(4*) Where the mark happens, there the ſupercilia of the paſſages are made *qua præciſa fuerit, ibi conſtituantur itinerum ſuperciliæ.*

The ſupercilia is, as has been explained at the third chapter of the third book, any cornice, or ſuperior moulding: it is here directed to be placed where the mark happens at the lower ſeats; which has been argued to mean the loweſt degree; and which, therefore, muſt be the place where the ſupercilia, p p, is to be placed.

But Vitruvius calls it the ſupercilia of the *paſſages*, mentioning *paſſages* (*itinerum*) in the plural. By its place it ſeems to be the ſupercilia, or cornice of the *paſſage* that goes round the back of the orcheſtra; and therefore it ſeems that the word *paſſage*, or *path*, ſhould have been mentioned in the ſingular; but it is not unuſual with Vitruvius to mention in the plural many words that appears to us to belong to the ſingular number; and the contrary (thus he mentions the architrave, or epiſtylium over a range of columns, in the plural, calling it the architraves, or epiſtyliums); ſo, if this paſſage round the orcheſtra was uſed to be divided into parts, by temporary partitions here and there between each entrance, &c. it would have been ſufficient to cauſe Vitruvius to ſpeak of it in the plural. This being mentioned in the plural, has cauſed Perault and Galiani to imagine, that by the word *itinerum* is meant the entrances or doors, z z, that lead into the orcheſtra; but firſtly, Vitruvius does not uſe that word to ſignify any kind of aperture, but for a paſſage or pathway, as in the third chapter foregoing, he uſes it for the paſſage way of the precinctions (*itineris precinctionis.*) Secondly, He gives no deſcription of thoſe doors or entrances, nor of any of the inteſtinal parts of the fabric; but deſcribes only the diſpoſition of the ſpectatory and ſcene of the theatre. Thirdly, There appears no reaſon that ſuch doors of entrance ſhould be governed, in their heighth, by the diameter of the orcheſtra, and vary as that varies (they being rather to be numbered among the parts hereafter mentioned, whoſe meaſure ſhould be the ſame in all theatres, whether large or ſmall, as reſpecting the natural magnitude of the human body, and cannot effect the proſpect of the theatre whether greater or leſs. Fourthly, Vitruvius poſitively mentions the paſſages (by the ſame term, *itineræ*) among thoſe things that are invariable in their dimenſions in all theatres, and therefore cannot here mean that the ſame *itineræ*, or paſſages, are to be governed in their dimenſions by the different magnitude of the orcheſtra. Fifthly, That the width of ſuch doors is as neceſſary to be adjuſted as their heighth; and, as the former is not mentioned, it may well be concluded that neither is the latter. Sixthly, The heighth of the paſſage round the orcheſtra (by which alſo the heighth of the loweſt degree is determined) is neceſſarily dependent on the magnitude of the ſame orcheſtra, in order that the heighth of the ſpectators may be adapted to the diſtance of the ſtage, as before urged: from all theſe arguments, therefore, it appears much more probable that it is the ſame paſſage round the orcheſtra here meant by the word *itinerum* that was before ſignified by the word *aditus*, and that the ſupercilia mentioned is the cornice of that paſſage. Vitruvius adds, *for thus they will have a ſufficient elevation*; the word THEY muſt be underſtood to allude the lower ſeats, not to the paſſages, notwithſtanding the order of the words may ſeem to point to the latter; for the foregoing notes ſhew that it is the loweſt degree, whoſe heighth is thus regulated by the magnitude of the orcheſtra; and not the paſſages, which were no ways dependant on the meaſure of the orcheſtra.

(5*) Vitruvius ſays, *the length of the ſcene ſhould be double the diameter of the orcheſtra.*

It has been before argued that Vitruvius uſes the word diameter in its proper ſenſe; there can, therefore, be no doubt of the meaning of this ſentence. Perault and Galiani, who have before underſtood diameter for ſemi-diameter, and have alſo made the diameter of their orcheſtra equal to half the diameter of the whole fabric, are in ſome difficulty to reconcile their opinions with the authority of the antique; and to get extricated from a web, in which they have entangled themſelves, they have each choſen a different method. Perault, finding that the veſtiges of ancient theatres prove that the ſcene was ever longer than the diameter of the or-

the orcheſtra, including (in that heighth) the corona and lyſis[6*]; upon the podium columns (s) are raiſed, which, with their capitals and baſes, are equal in heighth to the fourth part of the ſaid diameter. The entablature (t) is the fifth part of the heighth of the columns. The pluteum (u) above, with its baſe and coronæ, is the half of the inferior pluteum[7*]. Above this pluteum, are other columns (v), a fourth part leſs in heighth than thoſe below; their entablature is the fifth part of the columns. Alſo, if there is to be a third order, the upper pluteum is to be the half of the middle one, and the upper columns a fourth part leſs in heighth than thoſe of the middle order; the entablature likewiſe is to be the fifth part of the heighth of the columns.

HOWEVER, in all theatres, the ſame proportions and ſymmetry may not be ſuitable. An architect ſhould therefore conſider what ſymmetry is proper to be uſed, and what proportions the nature of the place, or magnitude of the work, may require; for there are ſome things that, both in ſmall and in large theatres, muſt, on account of convenience, be made of the ſame magnitude[8*]; ſuch are the degrees, the diazomatæ, plutei[9*], paſſages, ſtairs, pulpit, and tribunal[10*]; and if other things occur, that interfere with the ſymmetry, convenience muſt

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cheſtra, and that his former acceptation of diameter for ſemi-diameter, would make his ſcene no longer than the diameter of the orcheſtra: and alſo, that if he made the ſcene double the diameter of the orcheſtra, it would equal or even exceed the diameter of his whole building; has choſen to alter the text from *duplex* to *triplex*; and by that means he makes the length of his ſcene, once and half the diameter of the orcheſtra, or three ſemi-diameters. Galiani has made his ſcene no longer than the diameter of the orcheſtra, which is contrary to the authority of the antique; and is, beſides, very incommodious to the theatre; for the high walls of the returns of the ſcene, in his theatre, would obſtruct the ſight of the ſpectators; ſo that thoſe that ſat near either horn could not ſee the ſcene, or the revolving machines, but the edge of the ſtage only. The ſcene of the theatre at Pola, which was ſtanding, when meaſured by Serlio, was conſiderably longer than the diameter of the orcheſtra; ſo alſo was that of the theatre of Marcellus, as the remains of a pier and column ſtill ſubſiſting demonſtrate, as well as the draught of that theatre repreſented in the fragments of the plan of ancient Rome.

In the ſame fragments, there is alſo the repreſentation of another theatre, ſuppoſed to be that of Pompey, in which the length of the ſcene is likewiſe nearly double the diameter of the orcheſtra.

Theſe examples of antiquity, therefore, tend to confirm the foregoing arguments; and upon the whole it appears that we muſt adhere in this caſe alſo to the expreſs words of Vitruvius, and make the ſcene double the diameter of the orcheſtra, as he preſcribes. On one ſide of the ſcene, I have repreſented a veſtible, y, ſuch as the remains ſhew to have adjoined to the ſcene of the theatre of Marcellus.

(6*) Lyſis. See note 5*, chap. III. book III.

(7*) The *pluteum* and *podium* are the ſame, and ſignify what we call the *dado*. Philander has ſuppoſed the pluteum to be the entablature between a lower and higher order of columns; but the place here aſſigned them fully evinces the contrary. See note 3*, chap. I. book V.

(8*) Diazomatæ is the Greek name of the precinctions.

(9*) The plutei of the ſcene have been before ſaid to be always proportional to the diameter of the orcheſtra; theſe, which are ſaid to be always of the ſame dimenſions in all theatres, whether large or ſmall, muſt be ſituated in ſome parts of the ſpectatory, to ſerve as fences to the ſpectators, like our modern balluſtrades.

Their ſituation was probably at each precinction, and at the loweſt degree of the theatre, to ſecure the people from falling at thoſe precipices. I alſo ſuppoſe the degrees at either horn were terminated by ſuch plutei, in an inclination parallel to that of the degrees, and running up from the loweſt degree till they met the return walls of the ſcene.

(10*) The tribunal may be the place that was aſſigned for the ſeats of the prætors, or other magiſtrates, who preſided at the ſhews; for that the magiſtrates attended, and had particular places appointed for them, we may learn from Suetonius, who tells us, that Auguſtus ordered that the veſtals ſhould ſit at the podium, oppoſite to the prætor.

not be neglected. Likewiſe, if the materials, ſuch as marble, timber, and other things, which are uſed in buildings, ſhould be ſcarce, the work muſt be a little reduced or enlarged, till it properly agrees with the intention. This will be duly obſerved, if the architect is experienced, and is not deficient in ingenuity and judgment.

The ſcene is to be ſo contrived as to have doors (N) in the middle, with regal decorations: to the right and left the hoſpitalian doors (P), and near by[11*] the places allotted for the ſcenery. Theſe places the Greeks call *periactous*, becauſe therein are the revolving machines[12*] (R), having three ſides, and on each ſide a different kind of repreſentation, which, when there are any changes of the fable, or on the arrival of Gods with thunder, are ſuddenly turned, and change the kind of repreſentation in front. Near this place are the ingreſſes (I) of the returns; one ſuppoſed to lead from the forum, and the other from the country.

CHAPTER VIII.

Of the three Kinds of Scenes, and of the Theatres of the Greeks.

THERE are three kinds of ſcenes; one is called tragic, another comic, and the third ſatyric. Theſe are different and diſſimilar to each other. The tragic is compoſed of

(11*) Perault has tranſlated *ſecundum* (which Vitruvius always uſes for *near*, or *adjoining*, &c.) *derriere*, or *behind*, ſo making it to be underſtood that the revolving machines were placed behind the aperture of the doors, which would infallibly prevent the entrance of the actors, and render the doors uſeleſs; at leaſt thoſe machines muſt be turned every time an actor is to croud paſt them.

Vitruvius ſays they are near the hoſpitalian doors; and the order he obſerves in deſcribing the parts of the ſcene, gives us to underſtand, that they are on that ſide the hoſpitalian doors which is next the returns of the ſcene.

Galiani has diſpoſed them on either ſide the orcheſtra, in a line reaching from the horns thereof to the ſcene, in the manner of our ſide-ſcenes. This diſpoſition may ſuit very well with the theatre of Galiani, who makes the length of the ſcene to be no more than the diameter of the orcheſtra; but, as it has been ſufficiently proved that the ſcene ought to be in length double the diameter of the orcheſtra (by which length, the view from the ſpectatory is enlarged, and the ſtage better ſeen by the greater part of the ſpectators) that diſpoſition is very unſuitable for theatres ſo formed, as it hides the remaining length of the ſcene entirely, and obſtructs the view of the center of the ſtage, the regal and hoſpitalian doors, as well as thoſe of the returns from the ſpectators who ſit near, or even at ſome diſtance from, the horns of the theatre.

As the order Vitruvius obſerves in deſcribing the ſcene, is from the middle to the extremes, on the right and left, mentioning all the parts on the face of the ſcene in their order, in his way; and, as he mentions the ſaid revolving machines between the hoſpitalian doors and the entrances of the returns; it appears to me that their ſituation was moſt likely on the face of the ſcene, between the ſaid entrances; as ſee R R, Fig. XXXVI.

(12*) We know little of the nature of theſe machines more than what we may learn from this paſſage of Vitruvius; the ancients had other kinds of ſcenes, which were drawn before each other, like our modern ſcenes, and to which they gave the title of *ductilis*, as theſe that turned upon an axis were called *verſatilis*.

columns, faſtigiums, ſtatues, and other majeſtic objects. The comic has the appearances of private edifices, balconies, and windows, diſpoſed in imitation of the manner of common buildings. But the ſatyric is adorned with trees, vallies, mountains, and other rural objects, repreſented in topiarian work.[1*]

Fig. XXXVII. In the theatres of the Greeks the ſame methods entirely are not purſued; for, firſt, in the circumference (B H H) at bottom, where, in the Latin theatres, four triangles are formed, in theſe there are three ſquares, the angles of which touch the circumferent line; and that ſquare whoſe ſide (D D) is next to the ſcene, and interſects the curve of the circle, at that place determines the end of the proſcene; and from that point, at the extreme circumference (B) of the circle, a parallel line (P P) is drawn, on which the front of the ſcene is erected. Alſo, through the centre (A) of the orcheſtra, a line (H H) parallel to the line of the proſcene (D D) is deſcribed; and where it interſects the circular lines to the right and left, in the horns of the ſemicircle, centers (H H) are formed; and the compaſſes being fixed in the right horn (H), from the left interval (H), a circular line (H E) is drawn to the right ſide (E) of the proſcene[2*]; likewiſe the central foot being placed in the left horn (H), a circular line (H F) is drawn from the right interval (H) to the left ſide (F) of the proſcene. By this deſcription with three centers (H A H) the orcheſtra, and the receſs of the ſcene, in the Greek theatres, become larger; and the breadth (D P) of the pulpit, which they call *logeion*, is ſmaller[3*]; becauſe, with them, the tragic and comic actors perform on the ſcene, and the other performers act in the orcheſtra. Hence the Greeks

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(1*) The planning and planting of gardens, grounds, &c.

(2*) I am of Galiani's opinion, that the right ſide of the ſpectatory muſt be underſtood to be the left ſide of the proſcene; and the contrary; otherwiſe it is impoſſible to reconcile the circumſtances of the deſcription.

The preceding tranſlators, who have ſuppoſed the right ſide of the ſpectatory to be alſo the right ſide of the proſcene, have not been able to underſtand the deſcription themſelves; and the lines they draw, in attempting to explain it, are without uſe or meaning.

(3*) I am alſo of opinion, that not only the orcheſtra was by theſe centers, H H, continued from the horns of the ſemi-circle to the proſcene, but that all the degrees around the orcheſtra were alſo continued by the ſame centers to the proſcene, as I have ſhewn in my draught, Fig. XXXVII.

I can imagine no objection to this enlargement of the theatre; the words of the text do not oppoſe it; nor do they imply that the degrees muſt terminate at the horns of the ſemi-circle. In the Roman theatre, they terminated at that place; but, in the Roman theatre, the proſcene began there; and, as the degrees terminated againſt the line of the proſcene, in the Roman theatre, it is ſome reaſon for ſuppoſing they ſhould do the ſame in the Greek theatre. The degrees ſurrounded the whole orcheſtra in the former, why not therefore in the latter: it appears abſurd to make the orcheſtra extend forward to the front of the proſcene, unattended by the degrees, as Galiani has repreſented it. To what purpoſe is the ſpace between the horns and the proſcene applied? And how is it to be diſpoſed of? Beſides, Vitruvius, in the foregoing chapter, deſcribes the orcheſtra to be encompaſſed by the loweſt degree; we cannot ſuppoſe he means a part of the orcheſtra; his words imply the whole circumference, from proſcene to proſcene.

Galiani has not only made the degrees terminate at the horns, H, but has alſo incloſed them with a high wall, reaching to the top of the theatre; by which means, thoſe who ſat near the horns could not ſee the whole orcheſtra; nor, indeed, much farther than the center, A; a great number would be prevented from ſeeing the front of the ſtage, and a ſtill greater number could never ſee the hoſpitalian doors, or ſcenery. Inſtead of a high wall, a pluteum or balluſtrade running up the degrees, at their termination againſt the proſcene, would have been a ſufficient fence, and not have obſtructed the ſight of the ſpectators.

Fig. XXXVII.

diſtinguiſh them by the names of ſcenici and thymelici. The heighth of this logeum ſhould not be leſs than ten feet, nor more than twelve. The ſteps (C) between the cunei (K), and ſeats up to the firſt precinction (b), are diſpoſed oppoſite to the angles of the ſquares. From that precinction to the ſecond, they are directed in the middle between the former, and ſo on to the top, making as many changes as there are precinctions, and always enlarging.

When all theſe things are carefully and judiciouſly adjuſted, then great care muſt alſo be taken, that the ſituation choſen be ſuch, that the voice may exert itſelf with facility, and not recoil, or convey the ſignifications to the audience indiſtinctly; for there are ſome places naturally obſtructive of the motion of the voice; as the diſſonant, which the Greeks call catechontes; the circumſonant, which are called periecontes; and the reſonant, called antechontes; but the conſonant they name ſynechontes.

The diſſonant are thoſe where the firſt ſound having aſcended upward, is repelled by ſome ſuperior ſolid body, and recoiling downward, counteracts the aſcent of the enſuing ſounds; the circumſonant are ſuch where the excited voice revolving round, ſettles itſelf in the middle, without ſounding the terminations, and is there loſt, leaving the ſignifications of the words uncertain; the reſonant are ſuch wherein the ſound, meeting with ſome ſtrong repercuſſion, reverberates, and cauſes the terminations to be heard double; but the conſonant are thoſe wherein the aſcending ſound, being ſtrengthened from below, the words are clearly and diſtinctly conveyed to the audience.

Thus, if in the choice of the ſituation due care is taken, the effect of the voice, and the utility of the theatre, will be improved. Concerning their forms, which are different to each other, it is to be obſerved, that thoſe which are deſigned from ſquares, are uſed by the Greeks; and thoſe from equilateral triangles, by the Latins. By theſe inſtructions theatres may be erected with due perfection and propriety.[*]

([*]) After this deſcription of ancient theatres, it may not be improper to make ſome reflections concerning their application to modern uſe, and how far their mode of conſtruction may be conveniently imitated in modern theatres.

The ancient ſtage was limited by the fixed ſcene to a very ſmall proportional depth, or extent from the front; and the whole action was performed near the front of the ſtage.

The place of action, therefore, being confined to one ſpot, the ſpectators might very properly and conveniently be diſpoſed around it, in the form of a ſemi-circle.

But the machinery, changes of the ſcene, and other repreſentations which have been introduced in our modern theatres, require a great extent of ſtage. The place of action in modern theatres being, therefore, variable to all diſtances, from the front of the ſtage, the ſpectators cannot be conveniently ſituated round any certain point, ſo as to have their ſight always directed to the place of action; but, to have a perfect view of the whole ſtage at all diſtances, the ſeats muſt be diſpoſed in lines parallel to the front thereof, terminated at either end by a line at right angles, drawn from either ſide of the ſtage; or at leaſt the lines of the ſeats ſhould never exceed ſuch a portion of a curve as may be formed by a center, at the utmoſt diſtance of the ſtage, and terminated on the ſides by radial lines drawn from the ſame point, interſecting the front of the ſtage at either end; for, by this diſpoſition, every part of the ſtage will be expoſed to the view of every ſpectator.

But as one part of the entertainment of our theatres conſiſts in the ſight of the company, to which the ſemicircular diſpoſition of the ſeats is beſt adapted, it may be allowable to

CHAPTER IX.

Of the Porticos behind the Scenes, and of Ambulatories.

BEHIND the ſcenes, porticos are erected, for the people to retire to, in caſe ſudden rains ſhould interrupt the ſhews; and alſo to allow room for the managers to prepare the chorus. Such are the Pompeian portico, the portico of Eumenices, and of the temple of Bacchus at Athens; alſo the odeum, which is on the left hand, in returning from the theatre, and which Pericles raiſed at Athens with ſtone columns, and crowned with the wrecks and antennæ of the veſſels taken from the Perſians; this was burnt in the Mithridatic war, and reſtored by king Ariobarzanes. There is likewiſe the ſtrategeum of Smyrna, and the portico of Tralles, on both ſides, like the ſcene upon the ſtadium; and ſo in many other cities where they have had judicious architects, porticos and ambulatories are ſeen adjoining to the theatre. Theſe (porticos) ſhould be double, and have outwardly Doric columns, with the epiſtylium and entablature according to the modulary proportions of the perfect Doric. Their breadth

Fig. XXXVI. and XXXVII.

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prefer a diſpoſition that, though not ſo perfectly adapted to one, may partake of a moderate and equal ſhare of both.

The diſpoſition that, I conceive, would anſwer this intention is that I have ſhewn in the figures XLII. XLIII. and XLIV. where the front line of ſeats is a ſemicircle, whoſe center is in the front of the ſtage, as in the Roman theatre, and the ſeats behind are turned by the ſame center, but extend no farther round than to lines drawn from either horn of the ſemicircle, at right angles with the front of the ſtage. By this means the lines of the degrees becoming, as they recede, portions of larger circles, approach more to a ſtraight line, ſo that the nobles and perſons of fortune, who ſit in the boxes in the ſemicircle, will be beſt diſpoſed for the ſight of each other, while the populace in the galleries will be better ſituated for the ſight of the performances; each however partaking of a ſufficient ſhare of the convenience of the other diſpoſition.

The ſemicircle, I alſo imagine, gives a proper diſtance to the ſpectatory from the ſtage, and a moderate ſize to the orcheſtra or pit, which ſhould be no larger than is neceſſary to give a juſt diſtance to the front of the ſpectatory.

The degrees, or ſeats of the galleries, may be diſpoſed in the ſame manner as in the ancient theatres, riſing as they recede: all the other parts are ſufficiently explained by the draught.

The middle paſſage, A, leads to the ſemi-circle of boxes, B; the ſtairs, C, lead to the upper row of boxes; the royal apartment, E, in the middle, takes the heighth of both rows of boxes; the ſtair-caſes, F, at either end, lead to the galleries. After mounting the firſt and ſecond aſcent, F and G, the people return, by a paſſage over the firſt aſcent, F, into the paſſage, H; from whence they enter by the door, I; into the preciction of the firſt gallery, K.

To go to the ſecond gallery, L, they mount the third aſcent, marked M, in the elevation, and which is over the ſecond aſcent, C, and then turn again into another paſſage, which is over the former paſſage, H, from whence they enter by the door, N, into the ſecond gallery.

To go to the gallery, O, within the portico, at the top of the theatre, they aſcend the ſtairs, P, which brings them to the hinder part of the portico.

Seats on the ſtage ſhould never be permitted; and ſeats on the flanks of the theatre are very inconvenient; but, if they ſhould be required, they may be made between the columns, R, over the paſſage, H; a ſmall ſtair-caſe, Q, being made at the end of the ſaid paſſage, to lead to them from the level of the firſt ſtory; or otherwiſe the ſpaces between the ſaid columns may be adorned with paintings of dramatic ſubjects, &c.

A ſmaller theatre might be built on the ſame plan, by wholly omitting the ſecond gallery, L, and bringing the portico, O, down to the end of the firſt gallery, as is ſhewn by the figures XLV and XLVI.

ſhould be ſo determined, that whatever may be the heighth of the exterior columns (W), ſo much ſhould be the breadth from the outſide of the columns at the bottom, to the middle (x); and from the middle, to the walls (C), which incloſe the portico walks: the middle columns (x) are to be a fifth part higher than the the exterior, and are either of the Ionic or Corinthian kind.

But the proportions and ſymmetry of theſe columns are not to be the ſame as preſcribed for ſacred edifices; for, in the temples of the Gods, there ſhould be an appearance of gravity; but, in porticos, and ſuch other works, of gaiety.* If the columns therefore are of the Doric kind, their heighth, including the capital, is divided into fifteen parts, one of which makes the module, by which module the proportions of the whole work is to be regulated. The thickneſs of the column at bottom is two modules, the intercolumns five and a half; the heighth of the columns, without the capitals, fourteen modules; the heighth of the capitals one module, and their breadth two and a ſixth. The modulation of the other parts is the ſame as is written in the fourth book for ſacred edifices.

But if Ionic columns are uſed, the ſhaft, excluſive of the baſe and capital, is divided into eight parts and a half, of which one is given to the thickneſs of the column. The baſe, including the plinth, is made half the thickneſs of the column, and the capitals are formed in the manner deſcribed in the third book.

If they are Corinthian, the ſhaft and baſe is to be the ſame as in the Ionic, but the capital is made according to the rules written in the third book. Alſo the adjection, which is made in the ſtylobatæ, for the unequal ſcamilli, is taken from the deſcription written in the third book; and the epiſtylium, cornice, and all the other parts relative to the columns, are explained in the before written books.

Fig. XXXVII. The middle ſpaces (M), within the porticos, which are uncovered, are to be planted; for the hypæthral walks are exceedingly beneficial, and chiefly to the eyes; becauſe the air from the green plants, which is ſubtilized and attenuated by the motion of thoſe bodies, entering therein, clears the view, and, drawing from the eyes the groſs humours, leaves the ſight pure and acute; beſides, when the body, by the exerciſe of walking, grows warm, the air extracting the humours, diminiſhes corpulency, and thins and diſſipates whatever is ſuperfluous in the body. This is known by conſidering, that in covered places, where there are fountains of water, or the earth underneath abounds with ſprings, no cloudy vapours ariſe; but in open and uncovered places, as ſoon as the rays of the riſing ſun

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(1*) This is one, amongſt ſeveral paſſages in Vitruvius, which authorize a variation in the proportions of the orders, according to the purpoſe and deſtination of the work. There are, without doubt, ſome limits which ſhould not be exceeded; theſe, Nature and Reaſon muſt determine: but it cannot be neceſſary, nay it muſt even be erroneous, to adhere in all caſes indiſcriminately, to any certain meaſures or proportions. See the preface.

ſtrike the earth, they excite abundant vapours from the humid ſoil, conglobing and exhaling them upward. If therefore it is found that, in uncovered places, the air extracts the hurtful humours from the body, in the ſame manner as clouds are drawn from the earth, I think it cannot be doubted that the ambulatories in cities ſhould be ſpacious, agreeably planted, and be alſo open and uncovered.

But in order that they may be always dry and clean, they ſhould be made thus: They muſt be dug and emptied a proper depth; on the right and left drains are made, and in the walls which are toward the ambulatory, pipes are inſerted, inclining into the covering of the drains; this done, the place is to be filled with coal, and upon that the gravel for the walks is to be ſtrewed and levelled. Thus, by the natural ſuction of the coal, and the pipes infixed in the drains, the water is drawn off, and the walks will always remain dry and without moiſture.

In theſe buildings the ancients alſo made repoſitories for the neceſſaries of the city; for in ſieges, all things are more eaſily obtained than fuel; ſalt may be eaſily imported beforehand; corn, publicly or privately, may be ſoon collected; and, if it fails, fleſh, herbs, or pulſe may be ſubſtituted in its ſtead; water may be obtained from wells, and, in ſudden rains, received from the roofs; but fuel, which is abſolutely neceſſary for the preparation of foods, is with difficulty and trouble provided; for it is ſlowly collected, and quickly conſumed. In ſuch times therefore theſe ambulatories were opened, and a ſpace allotted to each tribe. Thus theſe uncovered ambulatories anſwer two excellent purpoſes; the one, health in peace; the other, preſervation in war. By theſe rules, therefore, not only the ambulatories behind the ſcenes of theatres, but alſo thoſe which, for the convenience of great cities, are erected to all the temples of the Gods, may be conſtructed. Having now ſufficiently explained theſe things, an account of the diſpoſition of baths follows next.

CHAPTER X.

Of the Diſpoſition and Parts of Baths.

Fig. XLVIII. FIRST, the warmeſt poſition is to be choſen, ſuch as is ſheltered from the north and north eaſt; and the caldaria[1*] and tepidaria[2*] ſhould be lighted from the winter weſt[3*], or, if that is oppoſed by the nature of the place, from the ſouth;

(1*) The hot bath, or ſudatory.

(2*) The warm apartment.

(3*) Meaning that point in the horizon where the ſun ſets at the winter ſolſtice, that is nearly ſouth-weſt; this is the poſition of all the Roman thermæ, whoſe ruins are ſtill to be ſeen; their fronts are north-eaſt; and back fronts, in which the baths probably were diſpoſed, are ſouth-weſt.

becauſe the principal time of bathing is from noon to the evening. It muſt alſo be obſerved, that the caldaria for the women ſhould be contiguous to that for the men, and be expoſed to the ſame aſpect; for thus the ſame hypocauſtum[4*] may ſuffice for the vaſaria[5*] of both.

Fig. XLVIII. and L. Over the hypocauſtum three caldrons are diſpoſed; one the caldarium (c), another the tepidarium (b), and the third the frigidarium[6*] (a). They are ſo diſpoſed, that as much water may flow into the tepidarium, as runs from thence into the caldarium, and in like manner from the frigidarium into the tepidarium[7*]; and the contours of the channels[8*] are heated by one common hypocauſtum.

Fig. LI. The ſuſpenſures of the caldarii are thus formed: Firſt, the bottom (a) is to be paved with foot and half tiles, inclining toward the hypocauſtum, that if the fuel ſhould be ejected, it may meet no reſiſtance inwardly, but roll back again to the entrance of the furnace; for thus the fire will naturally ſpread itſelf under the ſuſpenſion. Upon this eight inch earthen pillars (b) are raiſed, and ſo placed, that tiles of two feet may reſt thereon;

(4*) The furnace.

(5*) The vaſaria I ſuppoſe to be the apartment containing the veſſels wherein the water was heated. This paſſage gives us to underſtand that each hot-bath had its reſpective ſet of cauldrons.

(6*) The veſſels containing the hot, warm, and cold water.

(7*) Various are the conjectures of the commentators concerning the manner in which theſe cauldrons were ſituated and connected together: but the deſcription is not ſufficiently determinate to enable us to fix on any one. I ſhall, however, give the repreſentation of an ancient painting found in the thermæ of Titus, firſt publiſhed in Maffei's collection, wherein theſe vaſes, or cauldrons, appear diſcharging the water into one another, as Vitruvius deſcribes. See Fig. XLIX.

Galiani has ſo diſpoſed theſe cauldrons, that the frigidarium, though the moſt diſtant from the fire, muſt be heated equally with the caldarium; for the pipe of communication, which he has placed at bottom, unites the water in the three veſſels into one body; by which connexion, the moſt diſtant part is equally heated with the neareſt, the whole maſs making a circulation to and from the fire. This, I imagine, he has been led into by a deſire to ſituate the vaſes all on a level; but the vaſes may be diſpoſed all on a level, and the current of water from one to another preſerved, as Vitruvius directs, without placing the pipe, which diſcharges the water from one into the other, at the bottom of each veſſel. If the diſcharging pipes are made ſo much higher than one another as is equal to the diameter of one of the ſaid pipes, it will be ſufficient to anſwer the end. The pipes, being then placed at the top of each veſſel, will convey the water from the frigidarium to the other veſſels, without any poſſibility of the heat from the caldarium being communicated to the frigidarium, &c. See Fig. L.

With regard to the mode of ſupplying the baths, I imagine that, from the reſervatory, or aqueduct, a conſtant ſtream of freſh water ran into the frigidarium, where it became warm; from thence it ran into the tepidarium, in which it was made hot; and then ran into the caldarium, where it received the greateſt degree of heat; and from thence, a continual ſtream of hot water was conveyed by pipes into the bath, being tempered by a mixture of cold water, from the reſervatory, to the degree required. From the bath alſo, the ſame quantity of water that entered continually ran off, by waſte pipes or drains, at the top; thus, the dirt and impurities floating on the ſurface, and ariſing from the bodies of thoſe who bathed, was continually carried off by the ſtream, leaving the water of the bath always pure and clean.

(8*) *Alvei*, I tranſlate *channels*; for it is doubtful whether Vitruvius means by this word the vacuities of the cauldrons, or that of the baths, or ſome other kind of voids, or channels (for it is thought there were channels, or flews of maſonry, or fictile ware, uſed to convey hot and warm air into the cadariæ and tepidariæ, and which were alſo brought from the ſame hypocauſtum).

A little farther, alveus is mentioned with labrum; and by ſome ſuppoſed to ſignify the ſame thing (that is, the bath itſelf). It is certain that it is not there uſed for the cauldrons; but neither is it (in my opinion) for the void of the bath, as is obſerved at note 11*.

the heighth of the pillars is two feet; they are made with clay, having hair beaten therein; and upon theſe two feet tiles (c) are laid, which ſupport the pavement.[9*]

CONCERNING the floors, if they are of maſonry, they will be moſt ſerviceable; but if they are of timber they muſt be plaiſtered underneath, which is to be done thus: Iron bars or arcs are made, and, with prongs of iron, hung to the floor, very cloſe together. Theſe bars or arcs are ſo diſpoſed, that tiles without margins may lay between every two, and the whole arch is to be thus compleatly braced with iron. Then the joints on the upper part of theſe arches are to be ſtopped with beaten clay and hair; the under part, which is toward the pavement, being firſt plaiſtered with pounded tiles and lime, and afterward made ſmooth with ſtucco or white plaiſter. If, in the hot apartments, theſe arches are made double, they will anſwer the end better; for the humid vapours cannot then corrupt the timbers in the flooring, but they will be diſſipated between the two arches.

Fig. XLVIII. THE magnitude of the baths ſhould be ſuited to the number of the people. They are thus proportioned: A third part being deducted from the length, the remainder makes the breadth, excluſive of the ſchola (d), of the baſon (f), and the[10*]

(9*) It is doubtful whether Vitruvius means by the word *caldarii*, mentioned at the beginning of this paragraph, the veſſels containing the hot water, or the hot bathing apartments, for he gives them both the ſame appellation; Galiani ſuppoſes that he means the latter; under the floor of which, he thinks the furnace to have been; but, to this ſuppoſition theſe objections ariſe. Firſt, Vitruvius deſcribes the whole floor to be paved with tiles, which were laid inclining toward the hypocauſtum, or furnace, that the fuel, if ejected from it, might roll back again toward the mouth of the furnace; this, therefore, implies that the hypocauſtum did not extend over the whole floor, from wall to wall, but occupied a part thereof only; which was, doubtleſs, the middle part. It is alſo ſaid that the pillars of the hypocauſtum, that were raiſed upon this pavement, ſuſtained the pavement above; which, conſequently, was the pavement of what he here calls the caldarii. This caldarii then, whatever it was, could have extended no farther than the hypocauſtum; and the hypocauſtum occupied only a part of the floor. But the bathing apartments were, without doubt, ſurrounded by walls; and their floors, or pavements, extended from one wall to the other; therefore, thoſe which are here called caldarii, could not be thoſe bathing apartments. If it is ſaid that walls might poſſibly have been raiſed on the ſmall earthen pillars of the hypocauſtum, it is an objection too abſurd to deſerve an anſwer. Walls above muſt be built on walls below; and the areas of the floors above and below muſt be equal. Should it be ſaid that the hypocauſtum extended from wall to wall, over the whole floor; then I aſk, where ſhall we underſtand that tyle pavement to have been, which Vitruvius ſays was laid inclining towards the hypocauſtum; and how could the fuel that happened to be ejected ever recoil back to the mouth of the furnace?

It is certain that there muſt have been a furnace under the cauldrons, wherein the water was heated; and it is not certain that any furnace was neceſſary under the floors of the apartments: Vitruvius has deſcribed but one: it is not likely that the one he has deſcribed ſhould be the leaſt neceſſary; and that he ſhould wholly omit the moſt neceſſary: it is, therefore, more rational to accept the one he has deſcribed for that which we are ſure was abſolutely neceſſary and indiſpenſible, than for one which, whether or no there was any occaſion for, we are uncertain.

Vitruvius has, in the foregoing paragraph, ſpoke of the three cauldrons, which were placed over the hypocauſtum; and it appears moſt probable to ſuppoſe that he is here purſuing their deſcription, and informing us how they were ſupported, or ſuſpended (as he terms it) over the furnace. My opinion, therefore, is, that the word *caldarii* here alludes to thoſe three cauldrons, and that they were ſupported on the hypocauſtum, in the manner he here deſcribes. See a, b, c, fig. XLVIII.

In the ancient painting, figure XLIX, the cauldrons appear to ſtand upon arches, inſtead of upon ſmall earthen pillars; the reaſon of this difference may poſſibly be owing to the different methods uſed in different buildings, and at different times; for in the ruins of the Thermæ of Caracalla, at Rome, there ſtill remains a part of the ſuſpenſure, which agrees with this deſcription of Vitruvius. See fig. LI.

(10*) The ſchola is doubtleſs the walk or terras around the bath.

channel (e). The baſon (f) is ſo diſpoſed under the light, that thoſe who ſtand around may not obſcure it with their ſhadows. The ſcholæ of the baſons ſhould be made ſo broad, that, while the firſt comers are bathing, the ſurrounding ſpectators may wait commodiouſly. The breadth of the channel (e), between the wall and the pluteum, is not leſs than ſix feet; for the cauſeway and ſtep at bottom occupy two feet.

The laconicum and ſudatories adjoin to the tepidaria. Their heighth, to the bottom of the curve of the hemiſphere, is equal to their breadth, and an aperture for light is left in the middle of the dome, from whence a brazen ſhield hangs by a chain, by the raiſing and lowering of which, the heat of the ſudatory is tempered. This aperture ſhould be made circular, that the heat of the fire and vapour may, from the middle, diffuſe equally round the curve of the dome.

CHAPTER XI.

Of the Conſtruction of Paleſtræ.

Fig. LII. ALTHOUGH paleſtræ are not of Italian uſage, it ſeems to me proper to treat of their conſtruction, and of the manner in which they are built by the Greeks. In three porticos (A B C) ſpacious exedræ, having ſeats, are erected, in which the philoſophers,

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(11*) I cannot be of opinion that *alveus*, which I have rendered *channel*, is to be underſtood to be the ſame as the labrum, or baſon, if, as ſome have ſuppoſed; for a little farther Vitruvius ſays the *alveus* ſhould not be leſs than ſix feet in breadth; and it is not probable that a public bath could be no more than ſix feet broad, eſpecially amongſt the Romans, with whom they were in ſuch great requeſt. Pliny deſcribes his own private bath, at Laurentinum, to be large enough to ſwim in. Vitruvius ſays, *præter fabulam labri & alvei, exclusive of the fabula of the baſin and of the channel.*

I imagine this alveus, or channel, occupied one ſide of the margin of the bath, the other three being occupied by the ſchola; wherefore, in giving the proportion of the bath, he mentions the alveus with the ſchola, in order to include all the marginal parts of the bath, and to diſtinguiſh that he means that proportion to relate to the labrum, or bath only; and in that part of the margin of the bath which is called the alveus, the ſteps, or cauſeway, leading into the bath were diſpoſed.

(12) A *pluteus* being mentioned, proves that the cavity of the bath was ſunk below the pavement of the room, and not raiſed above it, in a kind of labrumor baſon, as repreſented in the ancient painting above-mentioned; becauſe, in that caſe, a pluteum would have been unneceſſary, the ſides of the labrum anſwering the intention of a fence.

Several ſuch labrums, or baſons of pophyry, are yet to be ſeen at Rome; they, therefore, were probably introduced after the time of Vitruvius, when thoſe magnificent thermæ came in uſe among the Romans.

(13*) Perault, Barbaro, and others, have underſtood the laconicum and ſudatory to have been one and the ſame apartment; but, in the following chapter, Vitruvius very clearly diſtinguiſhes them. In the painting found in the thermæ of Titus, fig. XLIX, the laconicum appears like a ſtove in the middle of the ſudatory; but the words of Vitruvius, who, in the next chapter, refers back to their deſcription in this chapter, proves that the laconicum was an apartment ſeparated from, yet adjoining to, the ſudatory; the uſe of it being to receive and temper the heat from the hypocauſtum, and communicate it to the ſudatory.

rhetoricians, and others who delight in the ſciences, may ſit to converſe; for, in the paleſtra's, a periſtyle[1*] (D) whether ſquare or oblong, is ſo contrived, that, in the circuit of its ambulatory, it may contain two ſtadiæ[2*]. This the Greeks call *diaulon*; and herein three porticos (A B C) are formed ſingle; and a fourth (E), which is diſpoſed to the ſouth[3*], double, that the weather, when tempeſtuous, may not annoy the interior walk.

In the double portico theſe apartments are diſpoſed: The ephebeum (F), which is a vaſt exedra with ſeats, is in the middle, and is made a third part longer than broad. Upon the right is the coriceum[4*] (G), then the coniſterium (H), adjoining; and next to the coniſterium, on the returns of the portico, is the cold bath (I), which the Greeks call *loutron*. Upon the left of the ephebeum is the elæotheſium[5*] (K); adjoining the elæotheſium is the frigidarium[6*] (L); and from thence is the entrance to the propingeum[7*] (M), on the returns of the portico. Near by, but more inward, behind the place of the frigidarium, is the vaulted ſudatory (N), in length twice its breadth; which has, on the returns, the laconicum (O) on one ſide,

(1*) Periſtyle literally ſignifies a circuit of columns; it is here to be underſtood an open area ſurrounded by a columnade.

(2*) A ſtadia is a furlong, or eighth part of a mile, containing ſix hundred and twenty-five Roman feet.

(3*) The words *ad meridianas regiones eſt converſa*, which I have rendered, *diſpoſed to the ſouth*, are ambiguous; former tranſlators have underſtood by them, that the double portico ſhould be expoſed to the ſouth; but I am of opinion that Vitruvius means it ſhould be placed on the ſouth ſide of the periſtyle, and conſequently be expoſed to the north; for Vitruvius deſcribes the frigidarium to be next to the portico; and the hot bath, ſudatory, &c. to be more inward, and behind the frigidarium; and therefore they muſt be lighted from the ſide oppoſite to the portico.

In the foregoing chapter, Vitruvius has told us that hot baths ſhould be lighted from the ſouth, or ſouth weſt, to the end, that they might be warmed by the rays of the ſun; which could not happen if this portico faced the ſouth; for the hot baths would, in that caſe, receive their light from the north. On the contrary, if the double portico is placed on the ſouth ſide of the periſtyle, then the baths, being lighted from the ſide oppoſite to the portico, will receive their light from the ſouth, agreeable to the directions of Vitruvius, and the frigidarium will very properly face the north; which, according to the interpretation of the tranſlators, would as improperly face the ſouth. It may alſo be added that the reaſon given for making this portico double (viz. to avoid the tempeſtuous weather) corroborates the ſuppoſition. The reaſon Palladius adds (viz. to avoid the heat of the ſun in ſummer time) is therefore unſuitable and void.

(4*) The commentators vary in their opinion concerning the uſe of the coriceum. Some ſuppoſe that as the ephebeum was the place of exerciſe for the youth, ſo the coriceum anſwered the ſame purpoſe for the girls, κορη, in Greek, ſignifying girls. Others imagine it to be the ſpheriſterium, or place where they exerciſed with the ball; and derive the name from one of the kinds of balls they uſed, which was called κωρυκος. Others again ſuppoſe the coriceum to be the ſame as the apodyterium, or undreſſing room; this latter conjecture ſeems the more probable, as the undreſſing-room was a neceſſary apartment to the baths; and it is wholly omitted, unleſs the coriceum was to anſwer that purpoſe. Alſo, the coniſterium, or apartment which contained the powder or ſand with which they rubbed their bodies, being deſcribed to be adjoining, adds ſome ſtrength to this opinion.

(5*) The eleotheſium is the room where they anointed, called by the Romans unctuarium.

(6*) This paſſage plainly diſtinguiſhes the frigidarium from the frigida lavatio, or cold bath. What diſtinct purpoſe the frigidarium anſwered can only be conjectured. Galiani thinks it anſwered the uſe of the tepidaria in the Roman baths; which was a room of a middle degree of heat, ſerving for thoſe who had uſed the ſudatory, or hot bath, to reſt in a ſhort time, in order to cool the body more gradually. To make another conjecture, it may have been the reſervatory of the cold water, from whence the baths were ſupplied; for Vitruvius has, in the preceding chapter, called the veſſel containing the cold water by the ſame name, and has aſſigned no other apartment in the paleſtræ for that indiſpenſible purpoſe.

(7*) Propnigeum is ſynonymous with hypocauſtum, or furnace.

built in the manner before written; and oppoſite the laconicum, the hot-bath (P). In the periſtyle of the paleſtræ, the parts are diſtributed as above written.

Outwardly three porticos are built; one (Q), in paſſing out from the periſtyle, and, on the right and left, the two ſtadial porticos (R S); of which the one (S) that faces the north is made double, and of a great breadth; the other (R) is ſingle, and ſo deſigned, that, in the parts which encircle the walls, and which adjoin to the columns, there may be margins for paths, not leſs than ten feet; and the middle is ſo excavated, that there may be two ſteps, a foot and a half in deſcent, to go from the margin to the plane (R), which plane ſhould not be leſs in breadth than twelve feet; by this means, thoſe who walk about the margins in their apparel will not be incommoded by thoſe who are exerciſing themſelves. This portico is, by the Greeks, called *Xyſtos*; becauſe, in the winter ſeaſon, the athletæ exerciſe themſelves in theſe covered ſtadiæ.

The xyſti have groves or plantations (T) between the two porticos, and walks between the trees, with ſeats of ſignine work. Adjoining to the xyſtus (R), and double portico (S), are the uncovered walks (U), which the Greeks call *peridromidas*, and we *xyſtus*; to which the athletæ, in fair weather, go, from the winter xyſtus, to exerciſe. Beyond[9*] the xyſtus is the ſtadium[10*] (W), made ſo large that the multitude of people may have ſufficient room to behold the conteſts of the athletæ. I have now deſcribed the proper diſpoſition of all buildings that are found to be neceſſary in large cities.

CHAPTER XII.

Of Ports, and of Structures built in the Water.

Some account of ports, and the means by which ſhips may be preſerved from tempeſts, muſt not be wholly omitted. Of theſe, ſuch as are natural, and have capes, or projecting promontories, from whence there is an inward curve or return, formed naturally, are experienced

(8*) Signinus is a kind of terras. See note 1*. chap. IV. Book II.

(9*) Vitruvius has before told us that the Greeks called the covered place of exercife Xyſtus; and here he tells us the Romans gave that name to the uncovered walks. This double and indeterminate ſignification of that word occaſions ſuch a perplexity in the deſcription as renders it very difficult to be underſtood; we cannot be certain when Vitruvius means the covered and when the uncovered ſtadia; and this has been the reaſon that the draughts of the paleſtræ, made by the ſeveral tranſlators, are ſo very different to each other.

(10*) The ſtadium was the place allotted for the performance of the races.

to be the moſt ſerviceable; for porticos or arſenals are built around, and a road is made from the porticos to the emporium, having towers on either ſide, from whence the chains may be drawn by machines.

But if the place is not ſo formed by nature, nor is adapted to ſecure veſſels from tempeſtuous weather, this method muſt be uſed: Walls or bulwarks muſt be carried forward from one ſhore, if no river prevents it, or if the ſtream may be turned, towards the other ſhore, and, by this means the incloſure of the port muſt be formed.

These ſtructures which are built in the water are to be thus executed: The ſand[1*] of the country, which extends from Cumæ to the promontory of Minerva, is procured, and mixed with lime, in the proportion of two to one; then, in the intended place, fences of oaken piles, bound with chains, are fixed in the water, and firmly united.

When this is done, the ground at the bottom of the water, between theſe fences, is, by means of tranſtilli[2*], cleared and levelled, and rubble ſtones, with mortar, mixed in the manner before written, is thrown in, till the ſpace between the fences is quite full. The countries above mentioned have this natural advantage.

But if theſe fences ſhould not be able to reſiſt the undulation and violence of the open ſea, then, from the ſame ſhore, a ſtrong buttreſs muſt be built. Half this buttreſs is built to a level plain, and the remaining part, which is next the ſea, has an inclined ſide. This done, on the part next the ſea, and round the ſides of the buttreſs, margins of a foot and an half are built, level with the plain part before-mentioned, and on the inclined ſide; it is filled with ſand to the level of the margins and plane of the buttreſs; then on this place a pier of a ſufficient magnitude is erected; and, when finiſhed, left to dry at leaſt two months. After this, the margins which ſupport the ſand are thrown down, and the ſand being then waſhed away by the waves, the pier is precipitated into the ſea. Thus, proceeding as often as neceſſary, the work may by this means be carried forward in the ſea.

But, in countries where the pozzolona ſand is not to be obtained, the following method muſt be uſed. In the place propoſed, double fences, well bound together with planks and chains, muſt be erected, and the intervals rammed with loam and bandages[3*] made of lake weeds. When they are rammed as cloſe as poſſible, then the cochlæ, rotæ, and tympani[4*] being applied,

(1*) This is the pozzolona ſand deſcribed at the ſixth chapter of the ſecond book.

(2*) What is meant by *tranſtili* is uncertain; but it may be ſuppoſed they were ſome kind of machines in uſe among the ancients, for the purpoſe of clearing and levelling the ground under the water. Barbaro thinks they were floats, or rafts of timber, on which the men ſtood to work.

(3*) The ſignification of the word *merenibus*, which, guided by the ſenſe of the context, I have rendered bandages, is alſo unknown.

(4*) Theſe machines are deſcribed in the ninth, eleventh, and twelfth chapters of the tenth book.

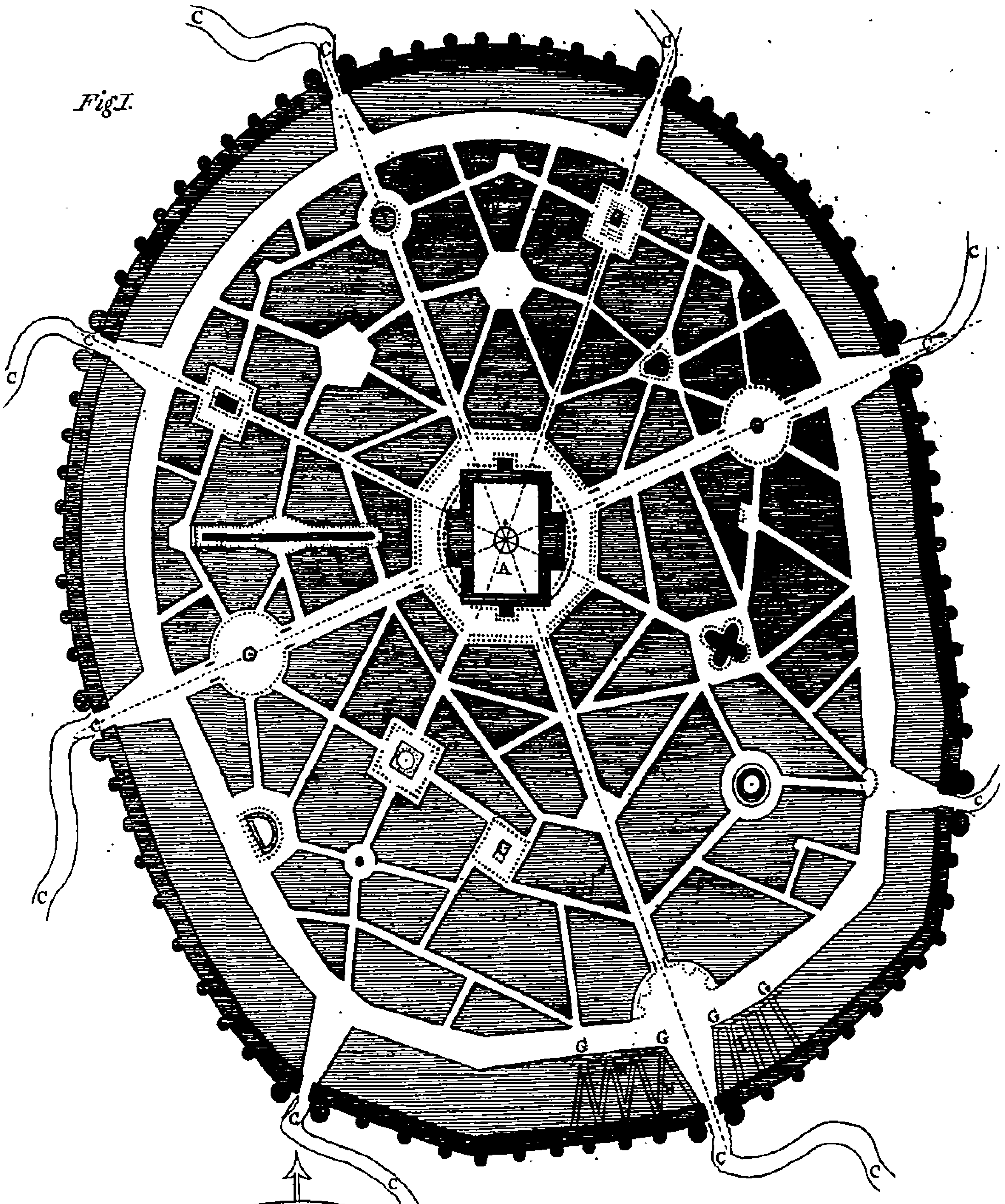
the place between the two fences is emptied and dried; and if the foundation is loose ground, it is dug till a solid bottom is found, larger than the wall which is to rest thereon. When it is thus emptied and dried, the wall is then completed with stones, lime, and sand. But, if the foundation should prove to be infirm, it is to be secured with piles of alder, olive, or oak, scorched, and the interstices rammed with coal in the same manner as has been described for the foundations of theatres and other walls; after which the wall is raised of hewn stones, the joints being as long as possible, that the middle stones chiefly may be secured by the joints. Then the inner part of the wall is filled with rubble or masonry, and thus a tower may be erected thereon.

This done, the arsenals are built so as principally to face the north; for the southern aspects, on account of the heat, breed and cherish moths, worms, and other noxious vermin. In these buildings very little timber is to be used, in order to avoid the hazard of fire. With regard to their magnitude, nothing can be determined; they must be made so as to be suitable to the greatness of the navy, and, in case larger fleets should be brought in, that there may be sufficient room to dispose them.

Concerning the public buildings which are necessary for the accommodation of cities, and the manner in which they should be designed and executed, I have, as far as they have occurred to me, treated in this volume. The symmetry and convenience of private buildings I shall explain in the following books.

THE END OF THE FIFTH BOOK.

Fig.I.



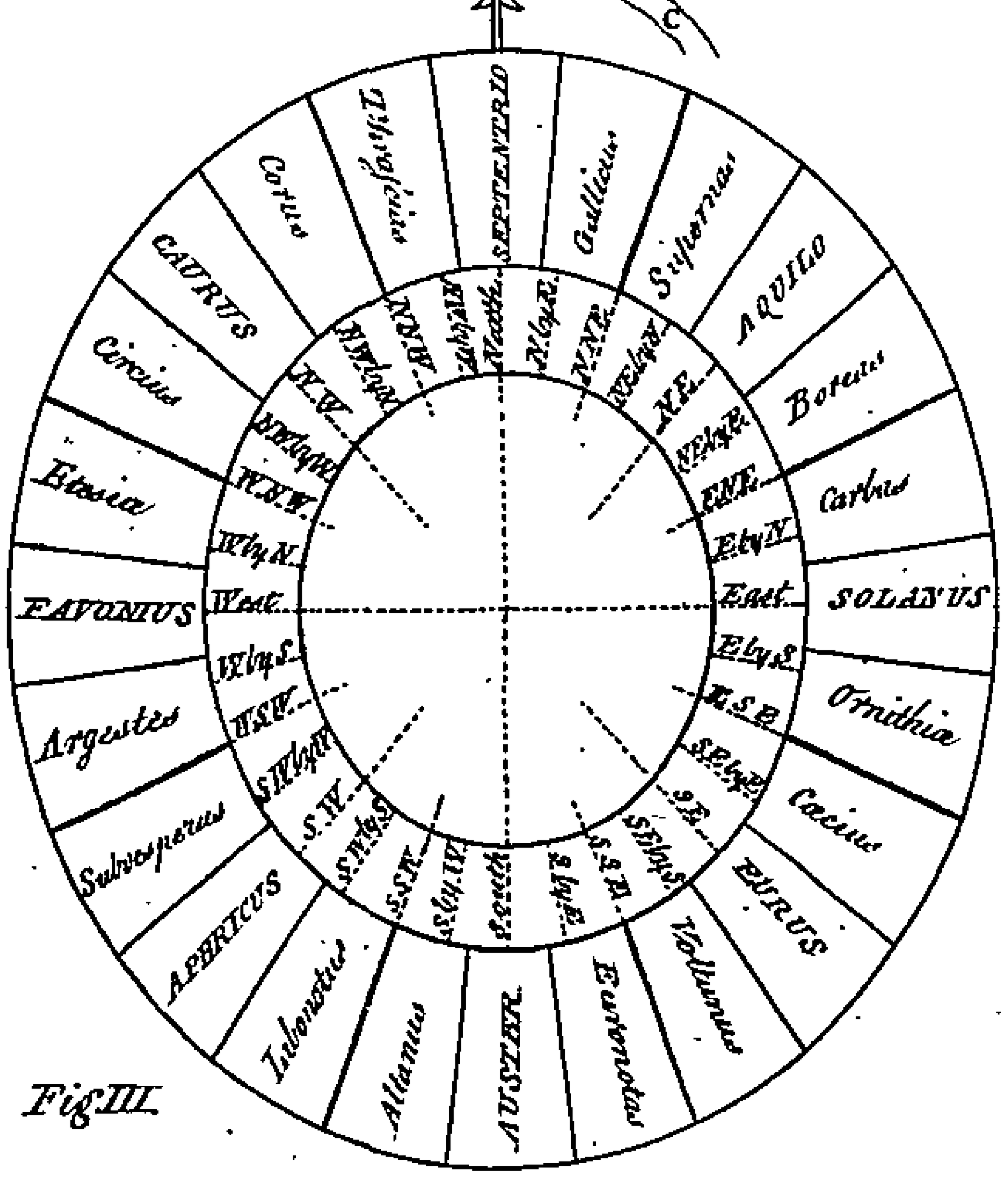
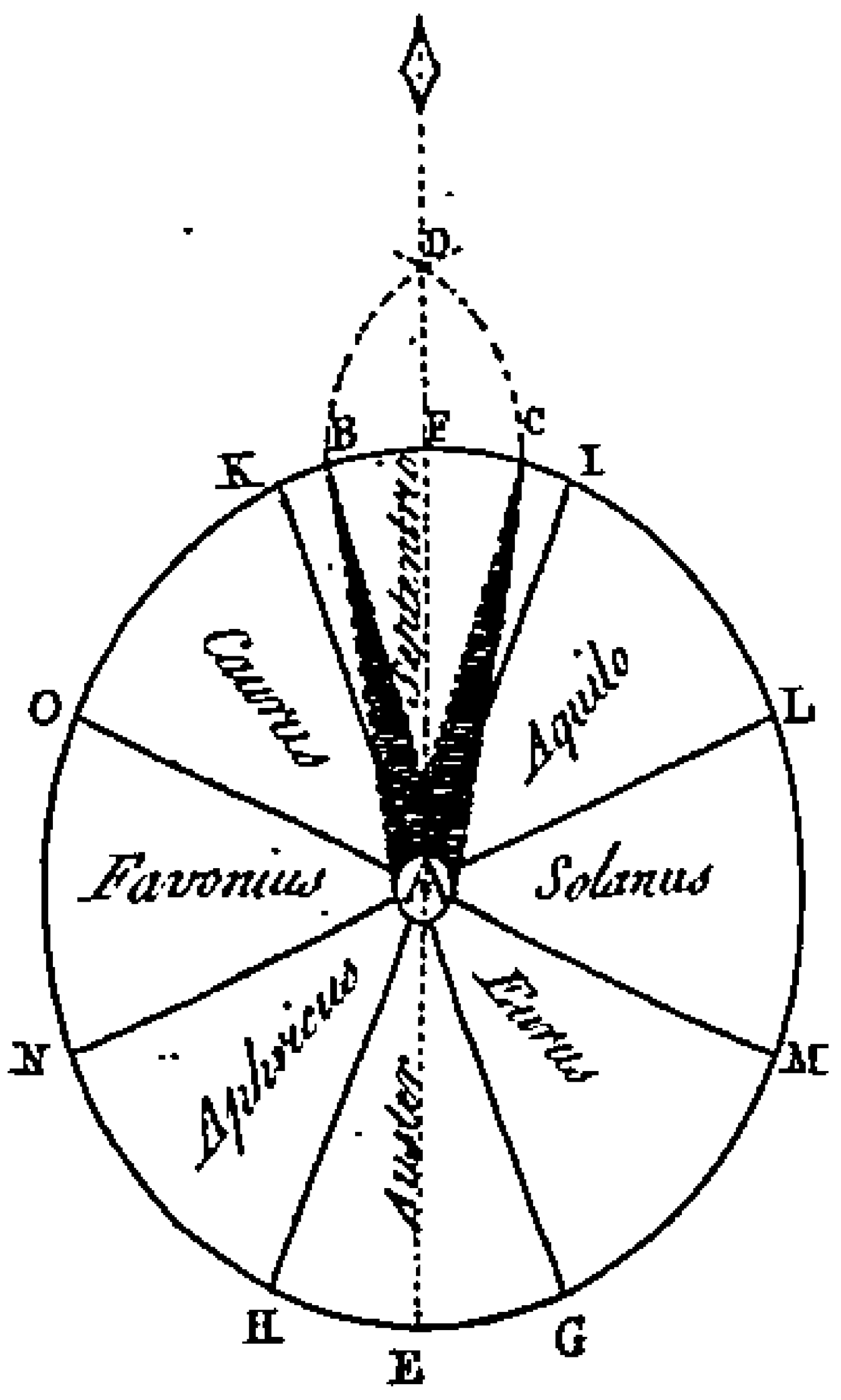


Fig.III.



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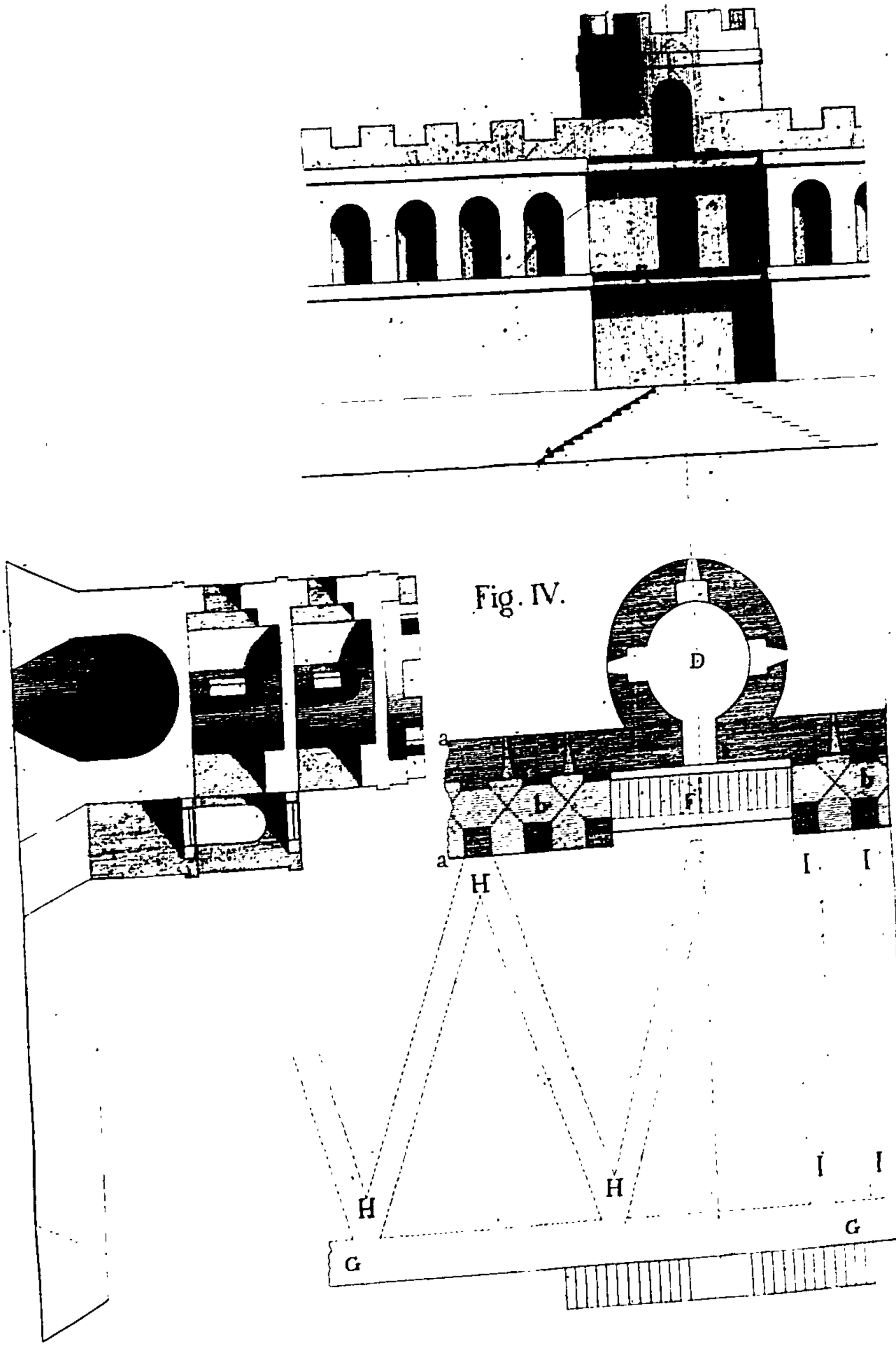

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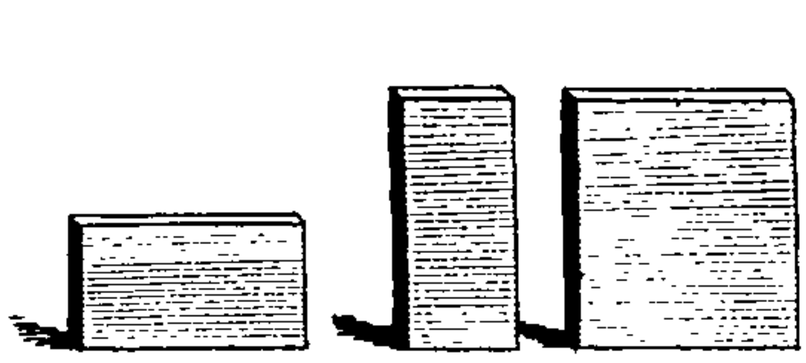
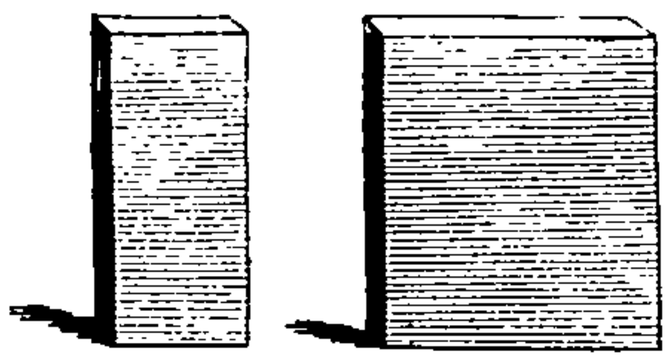


Fig.V.

Fig.VI.



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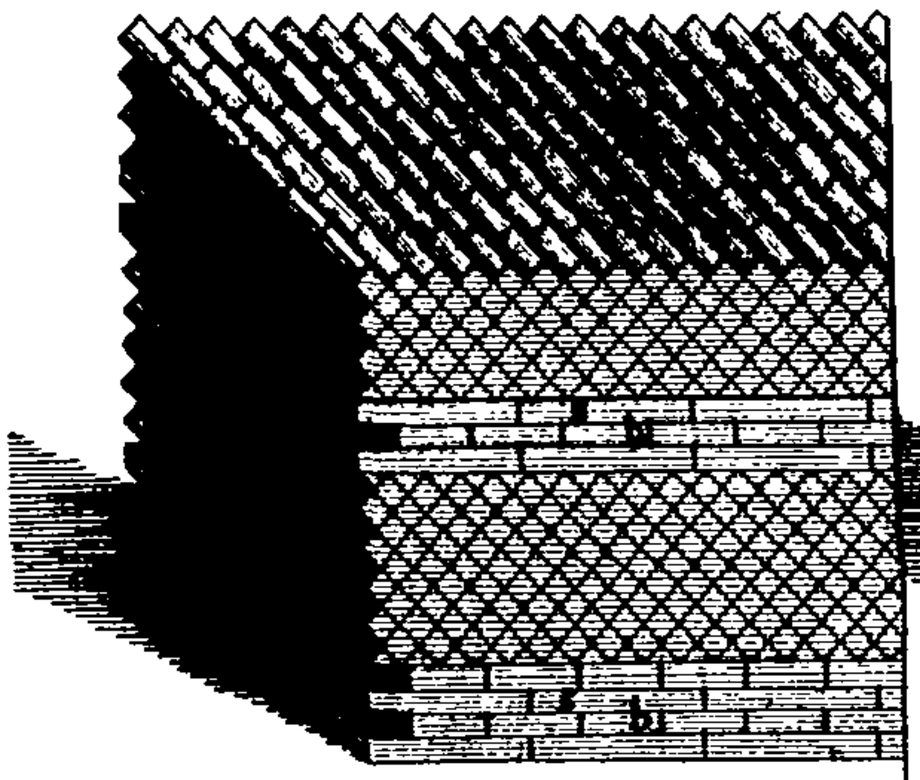

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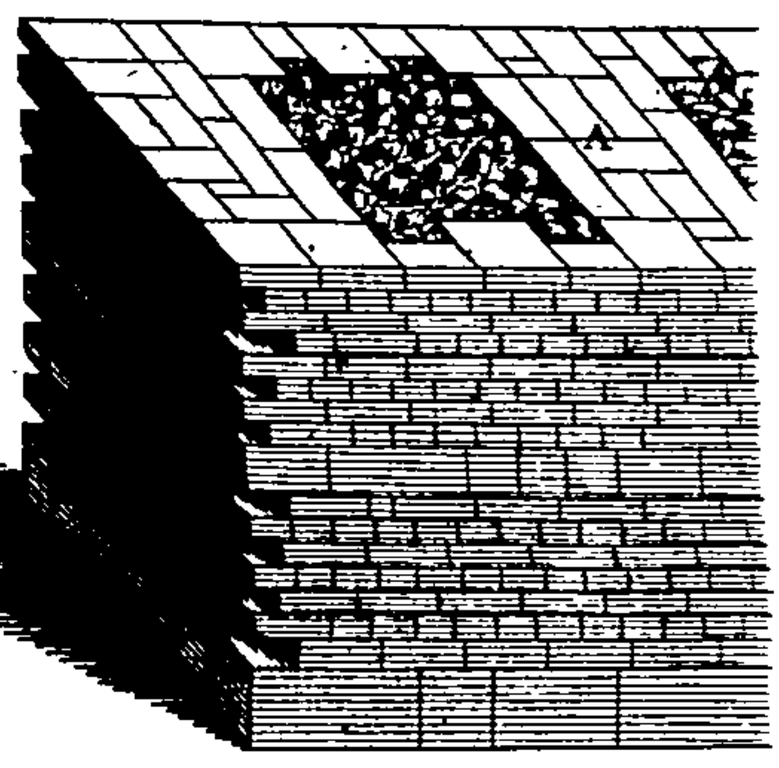

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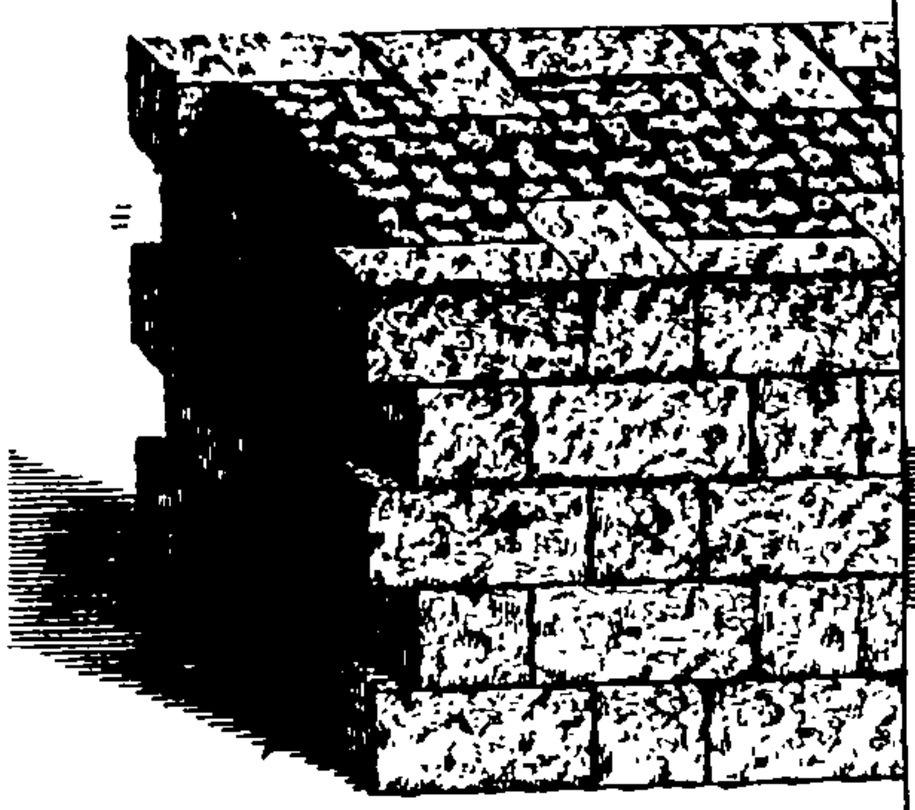

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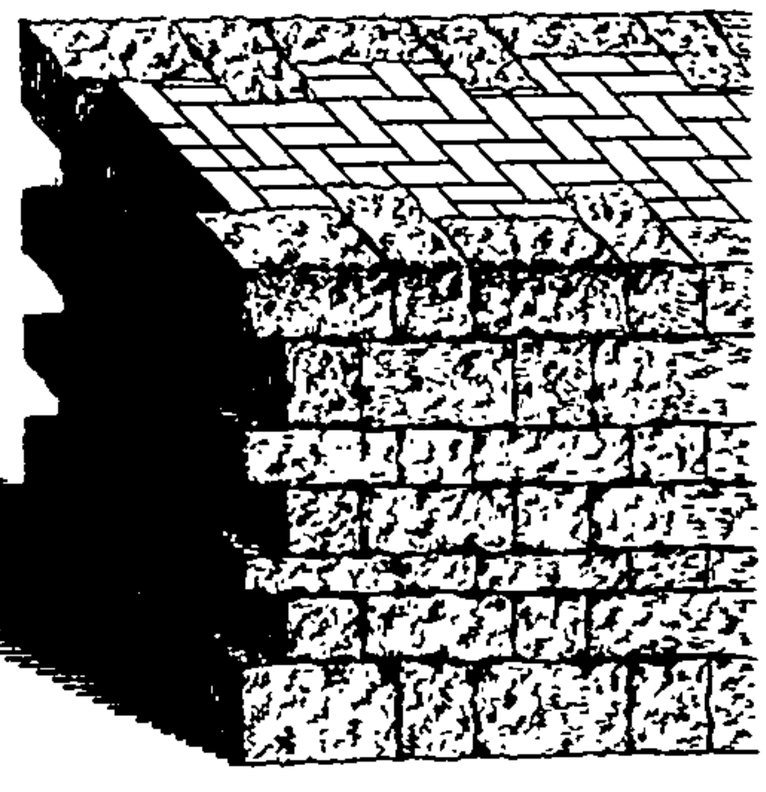

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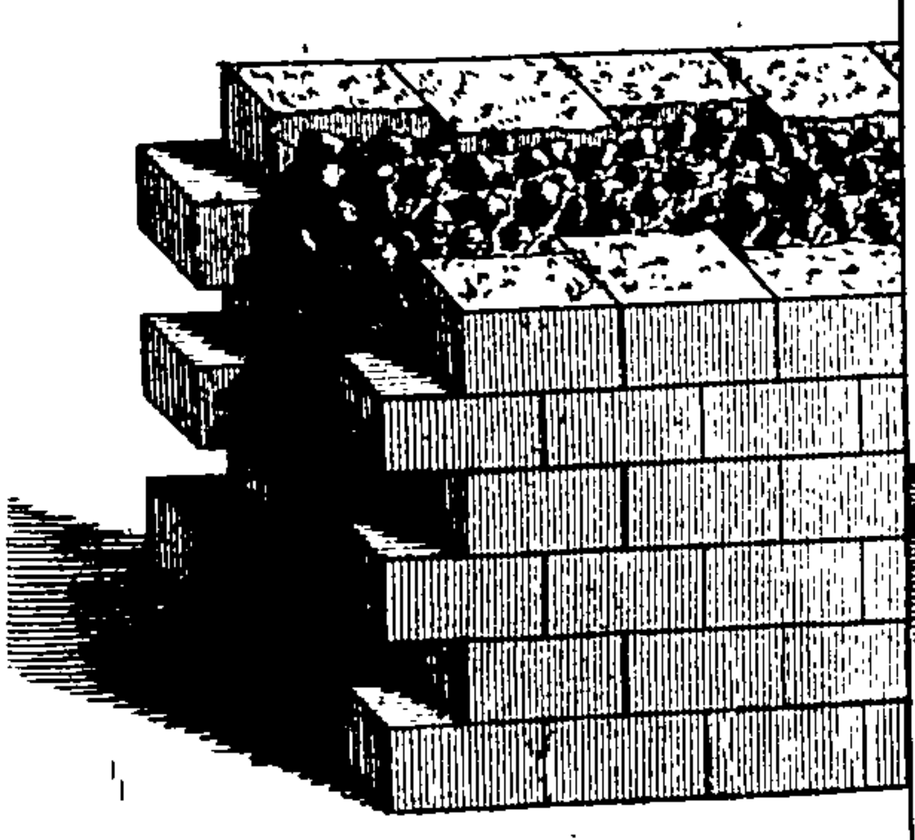

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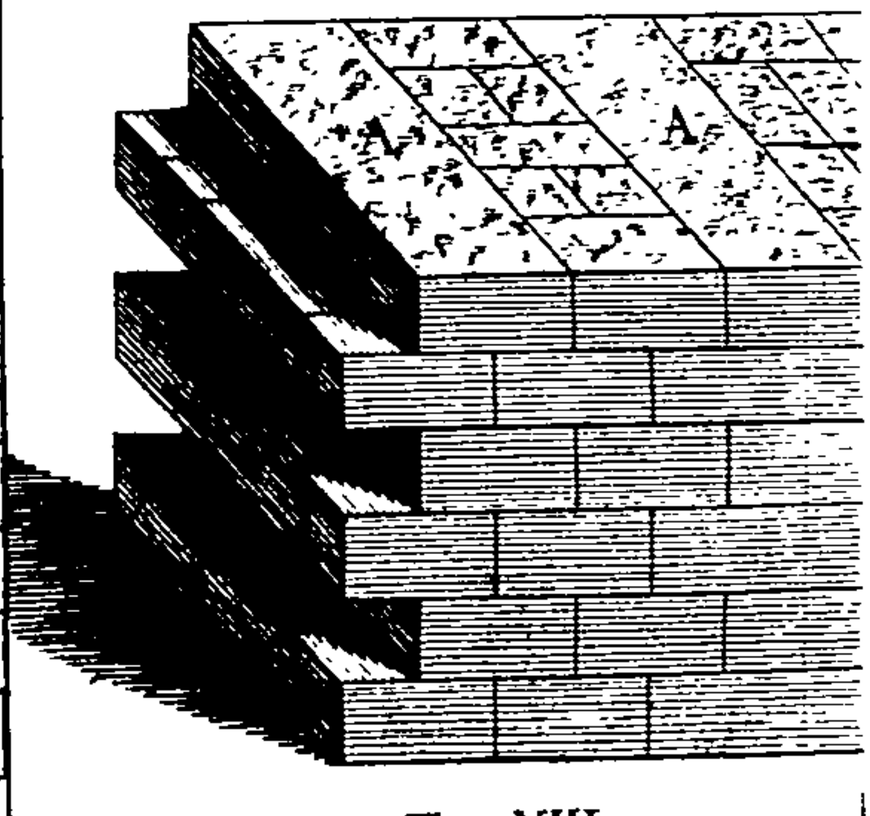

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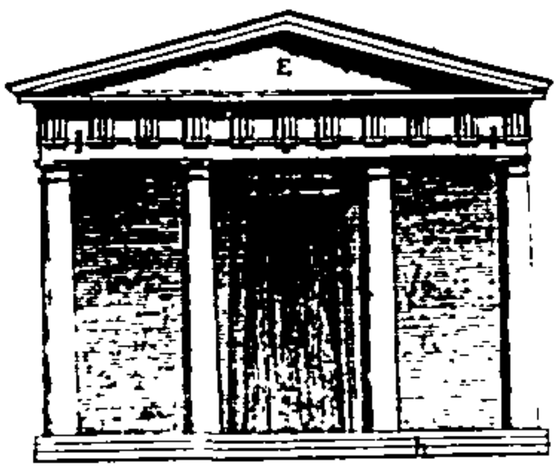

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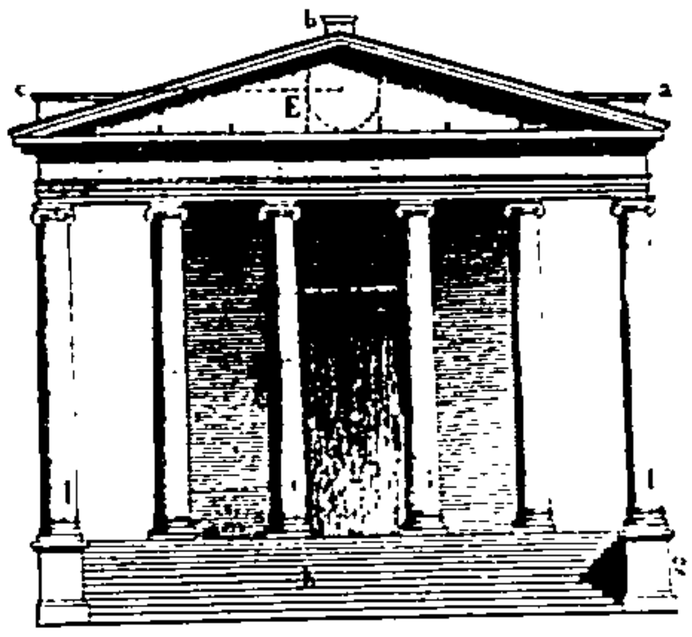

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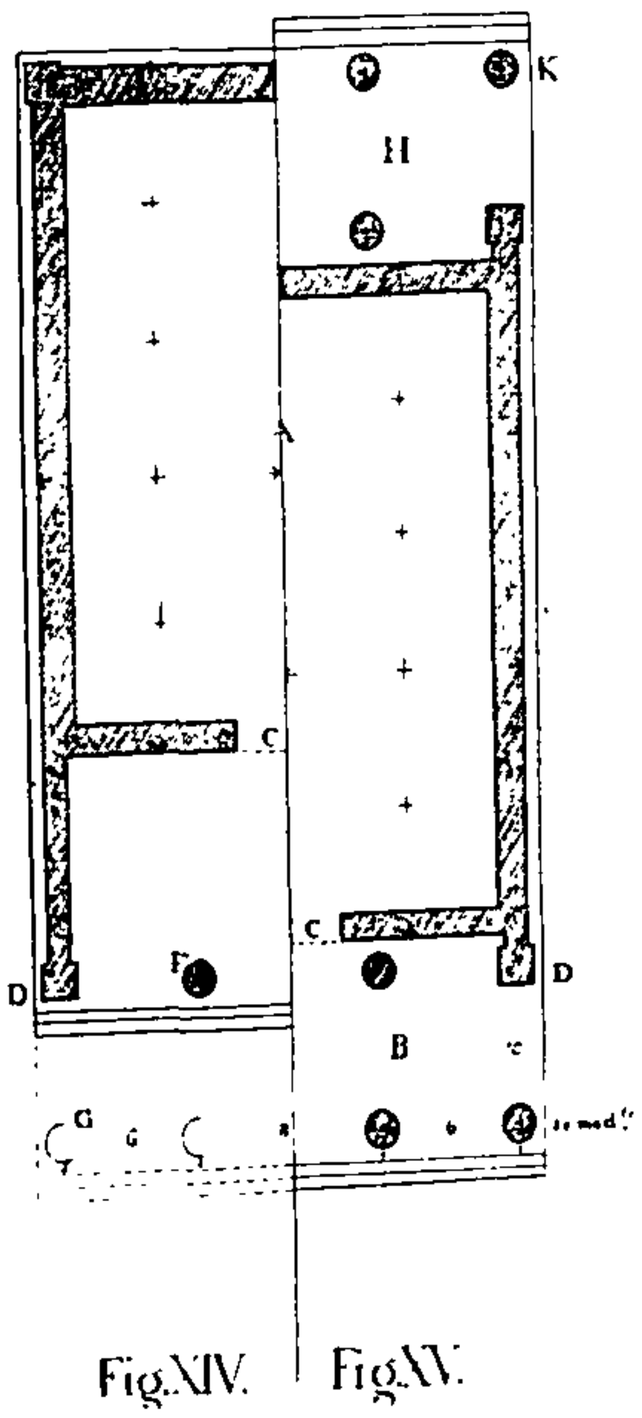

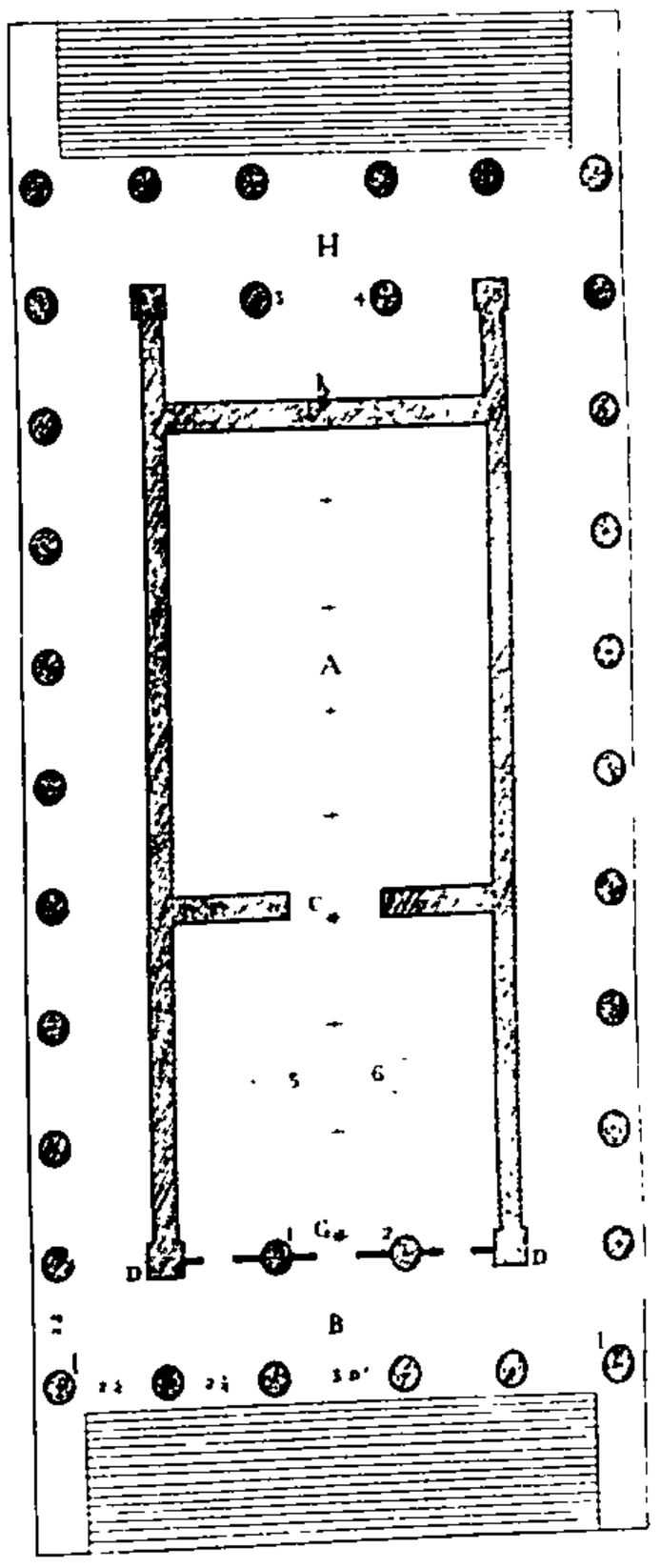

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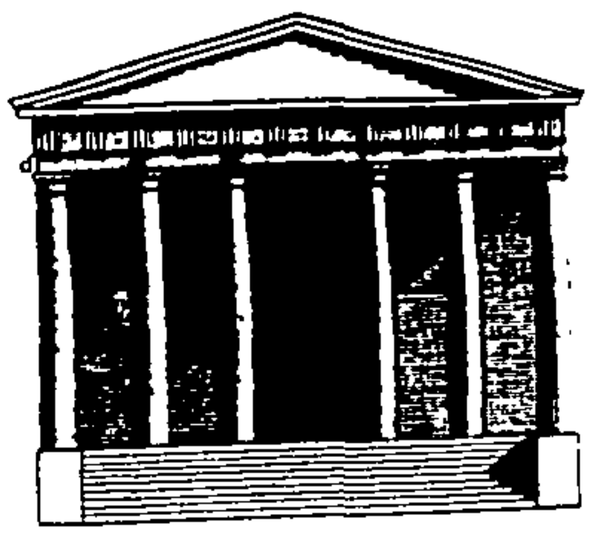

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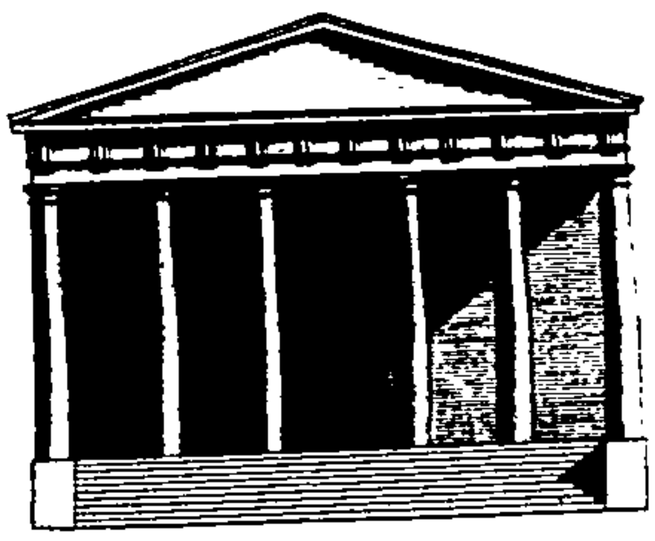

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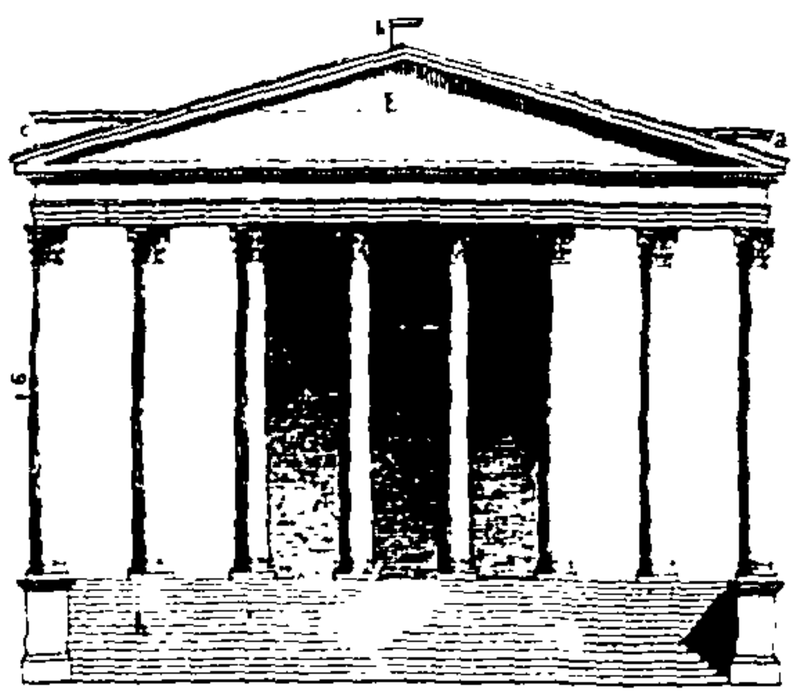

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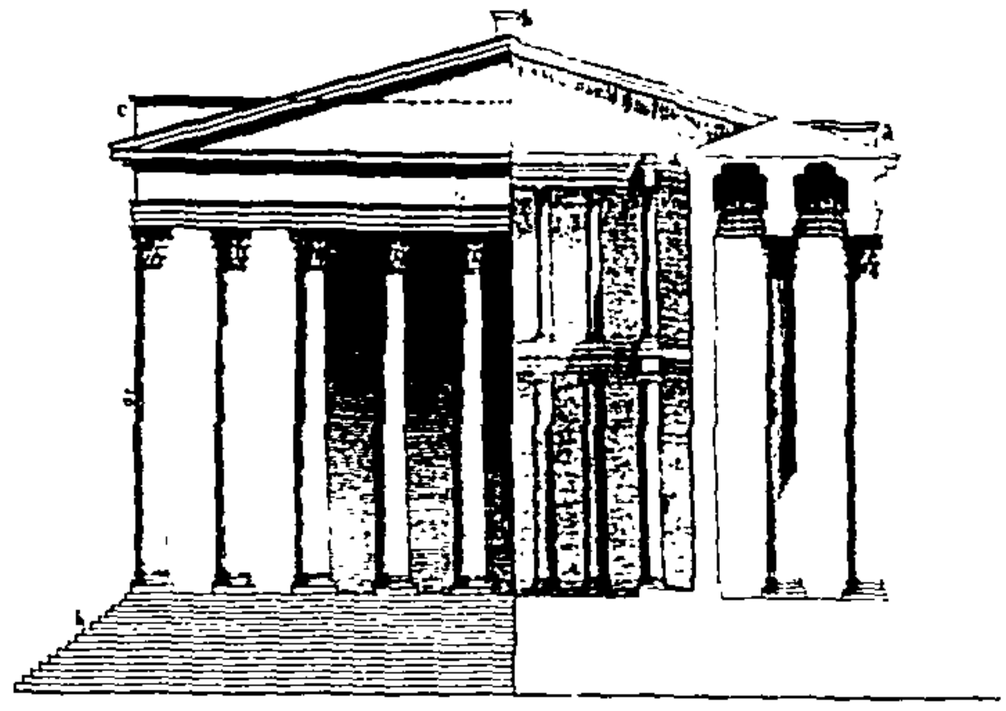

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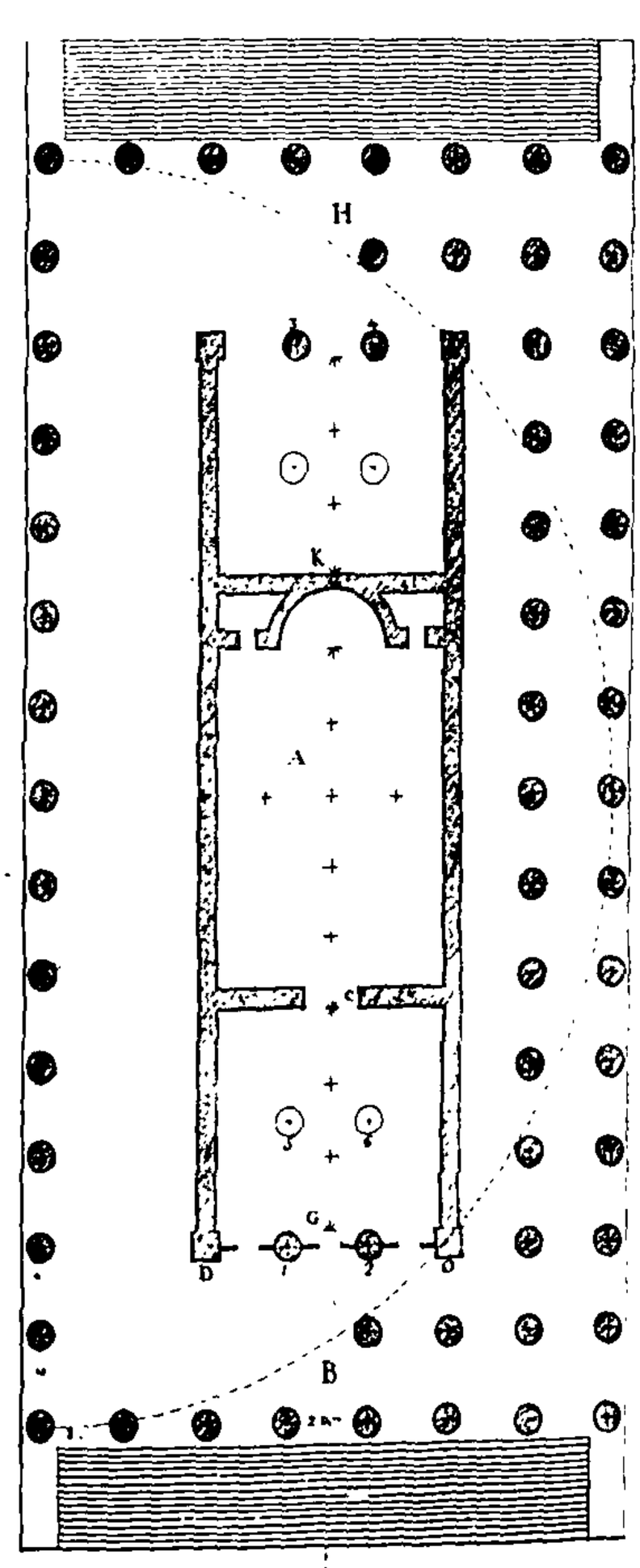

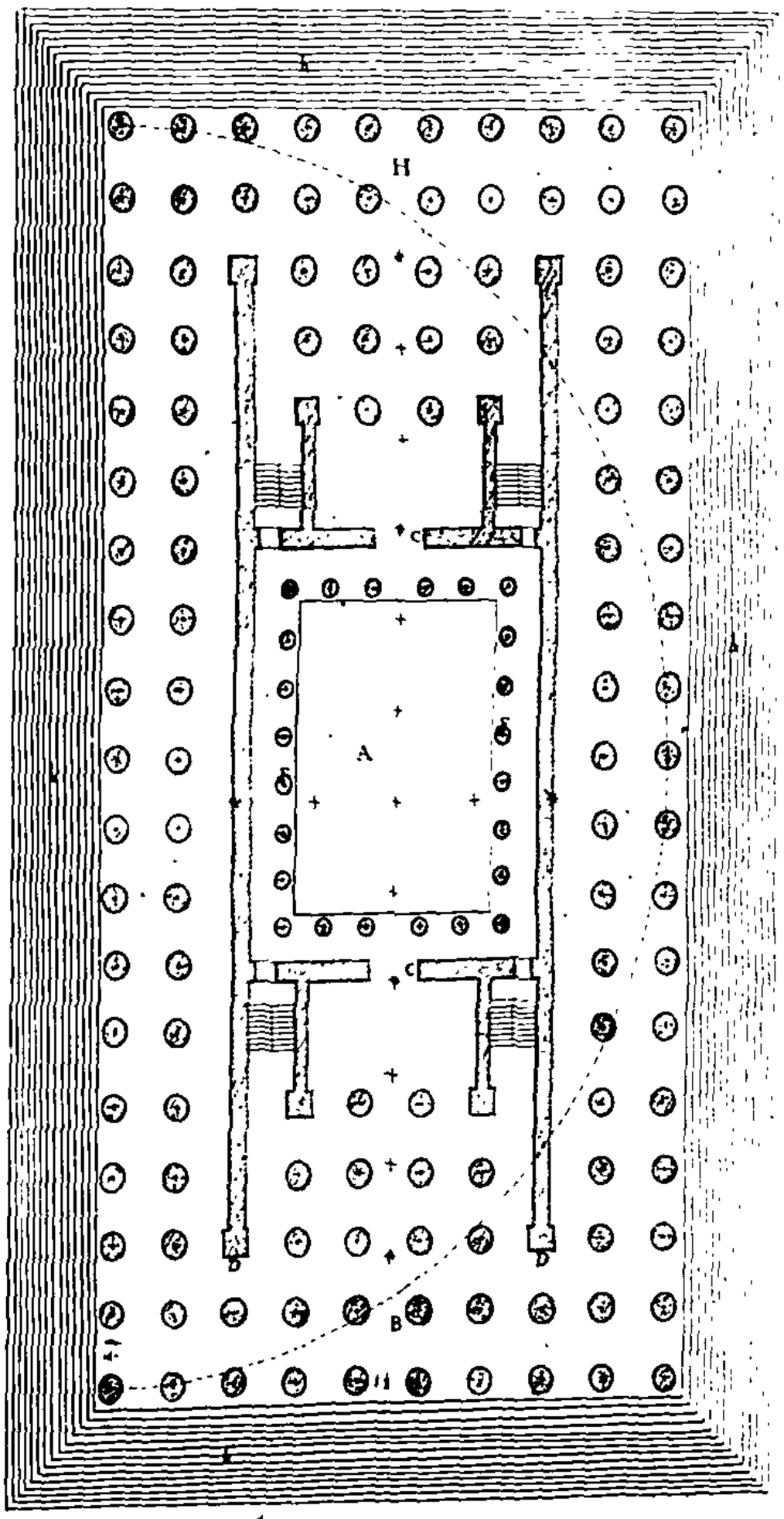

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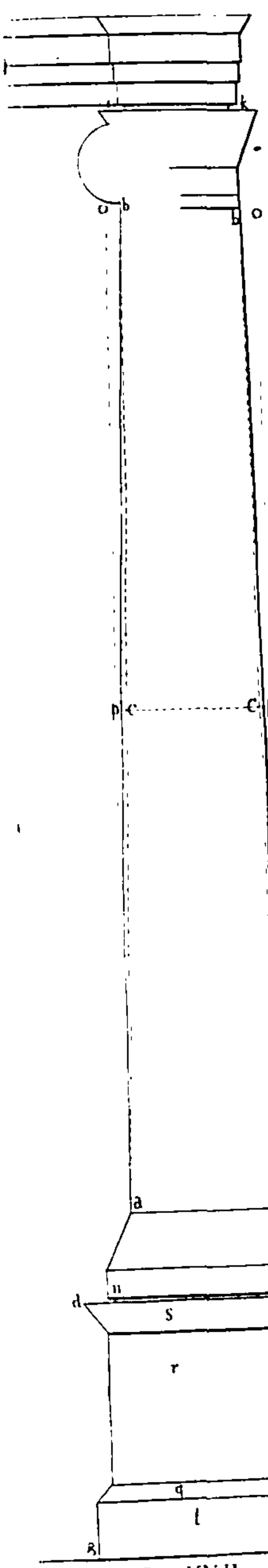

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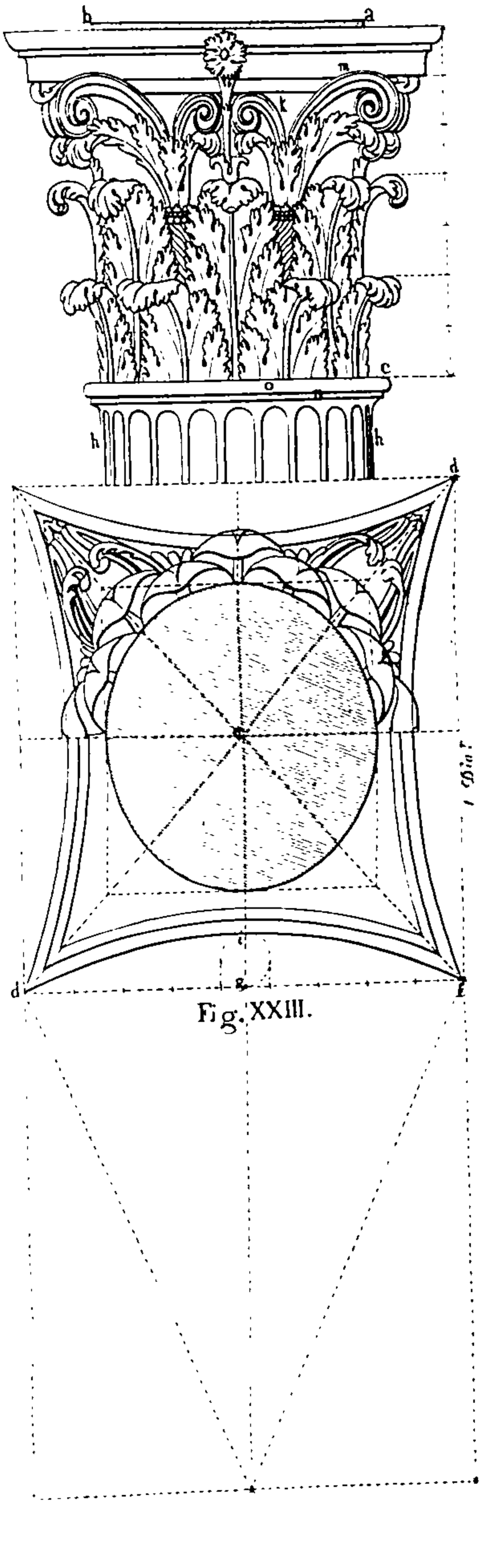

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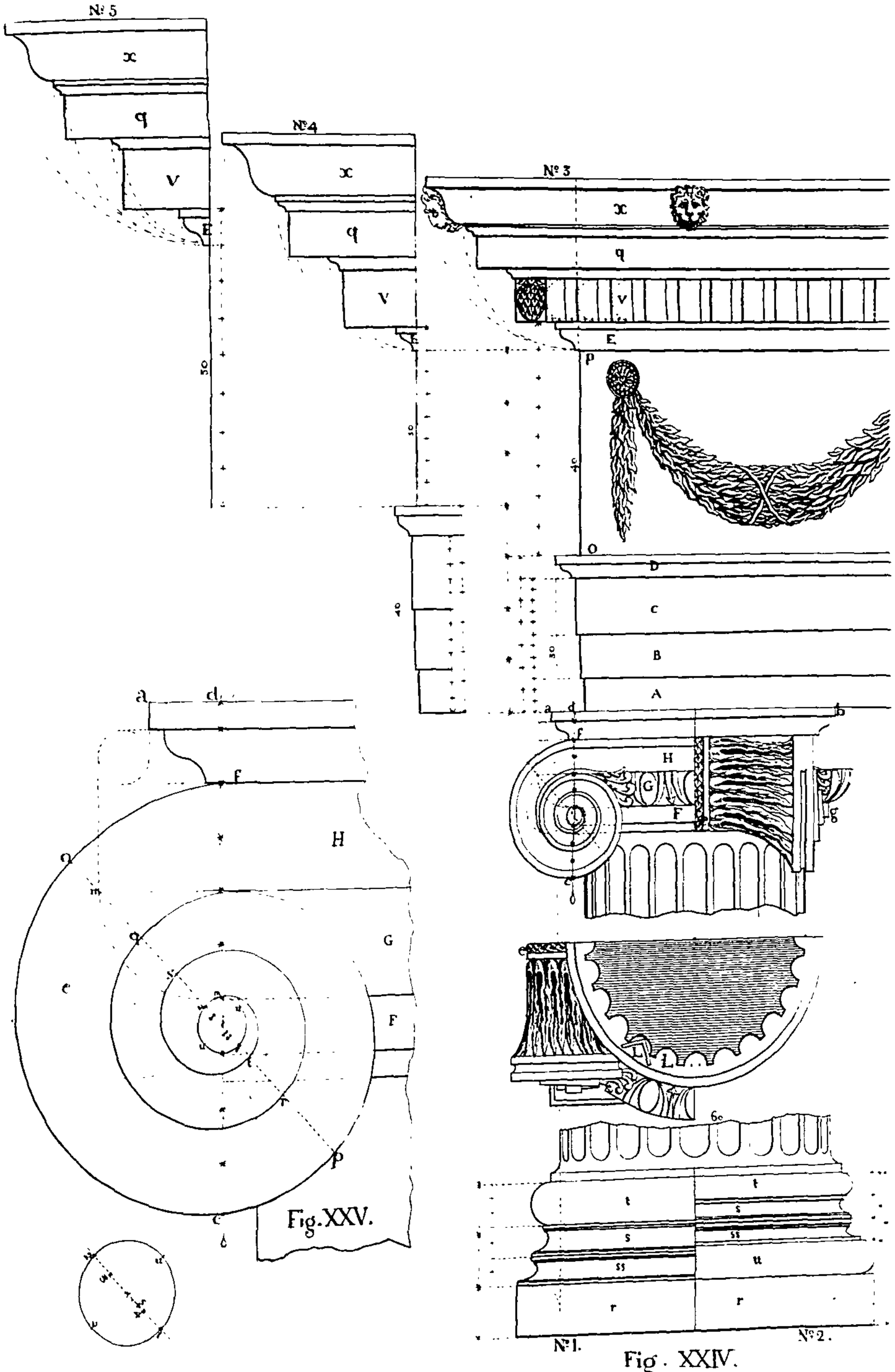
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Fig. XXV.
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Fig. XXIV.

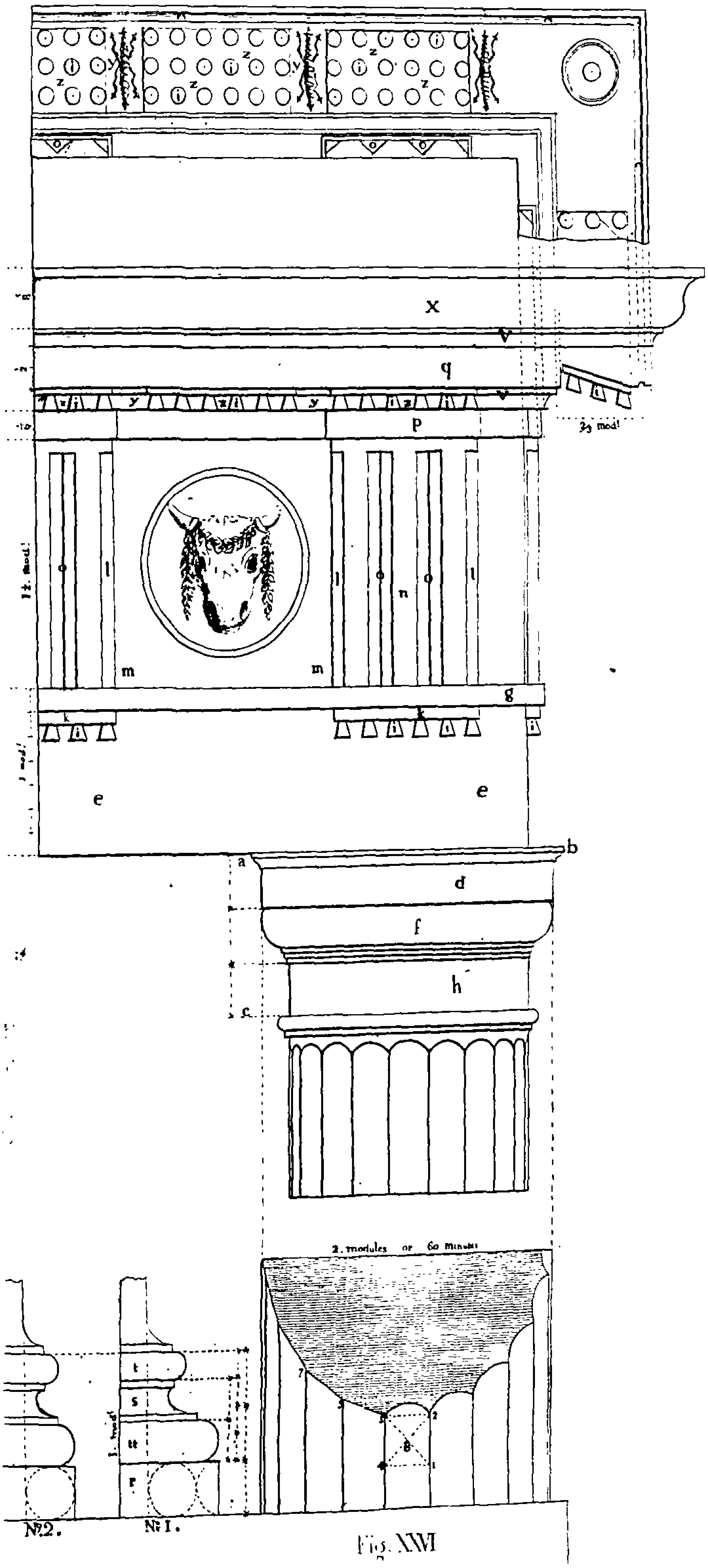


Fig. XWI

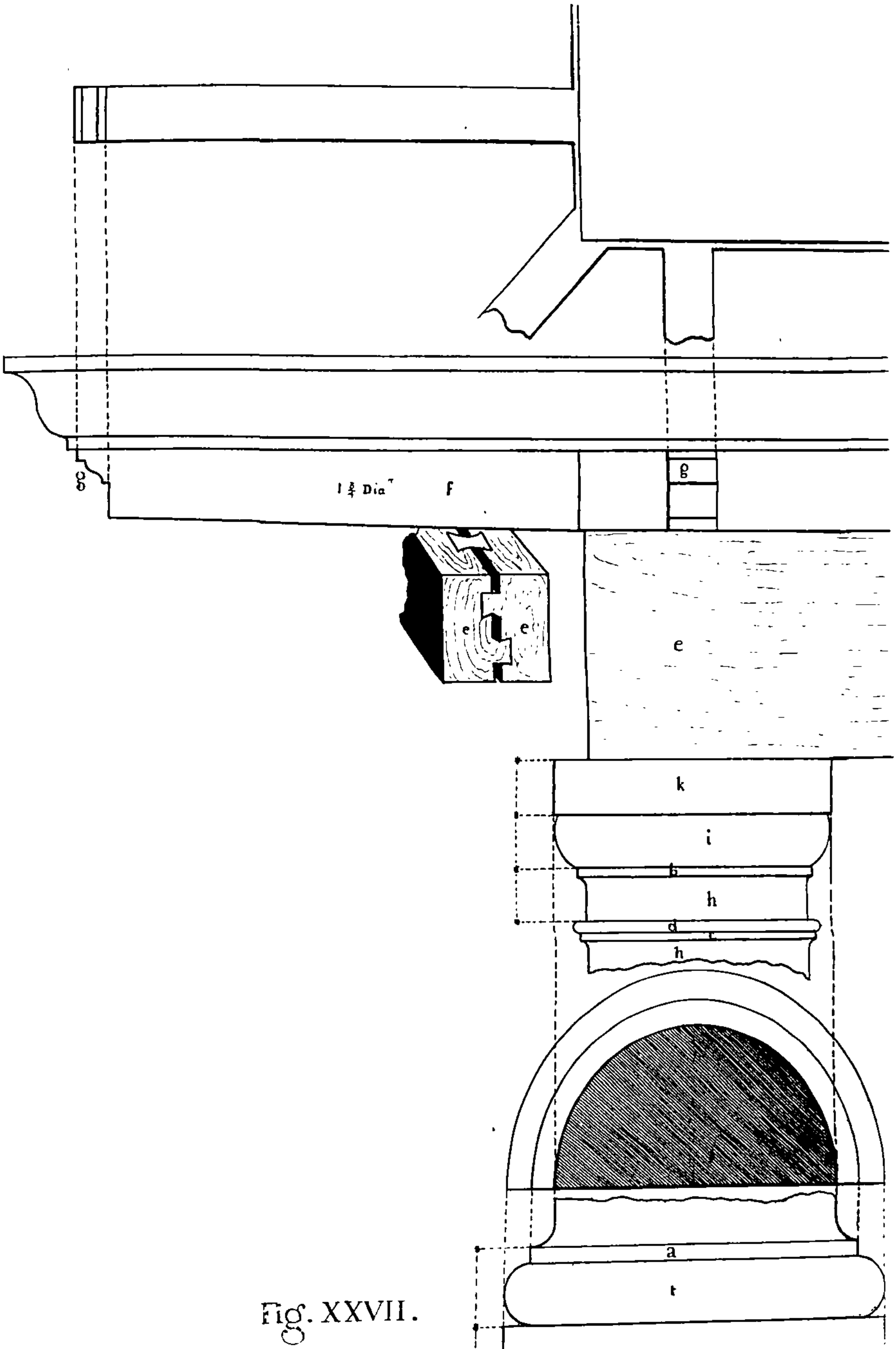
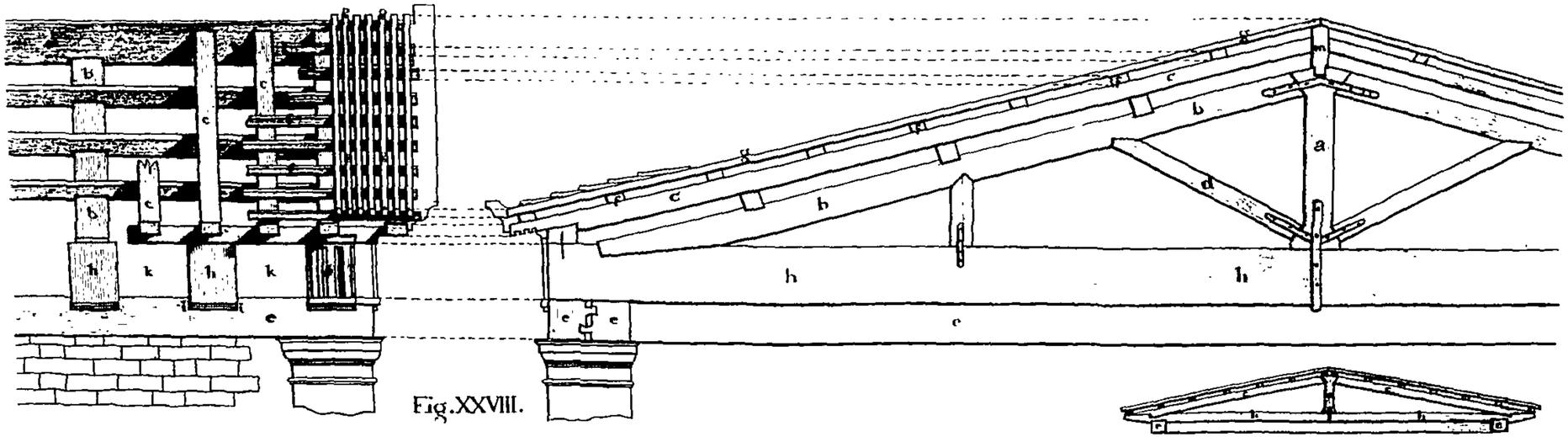


Fig. XXVII.



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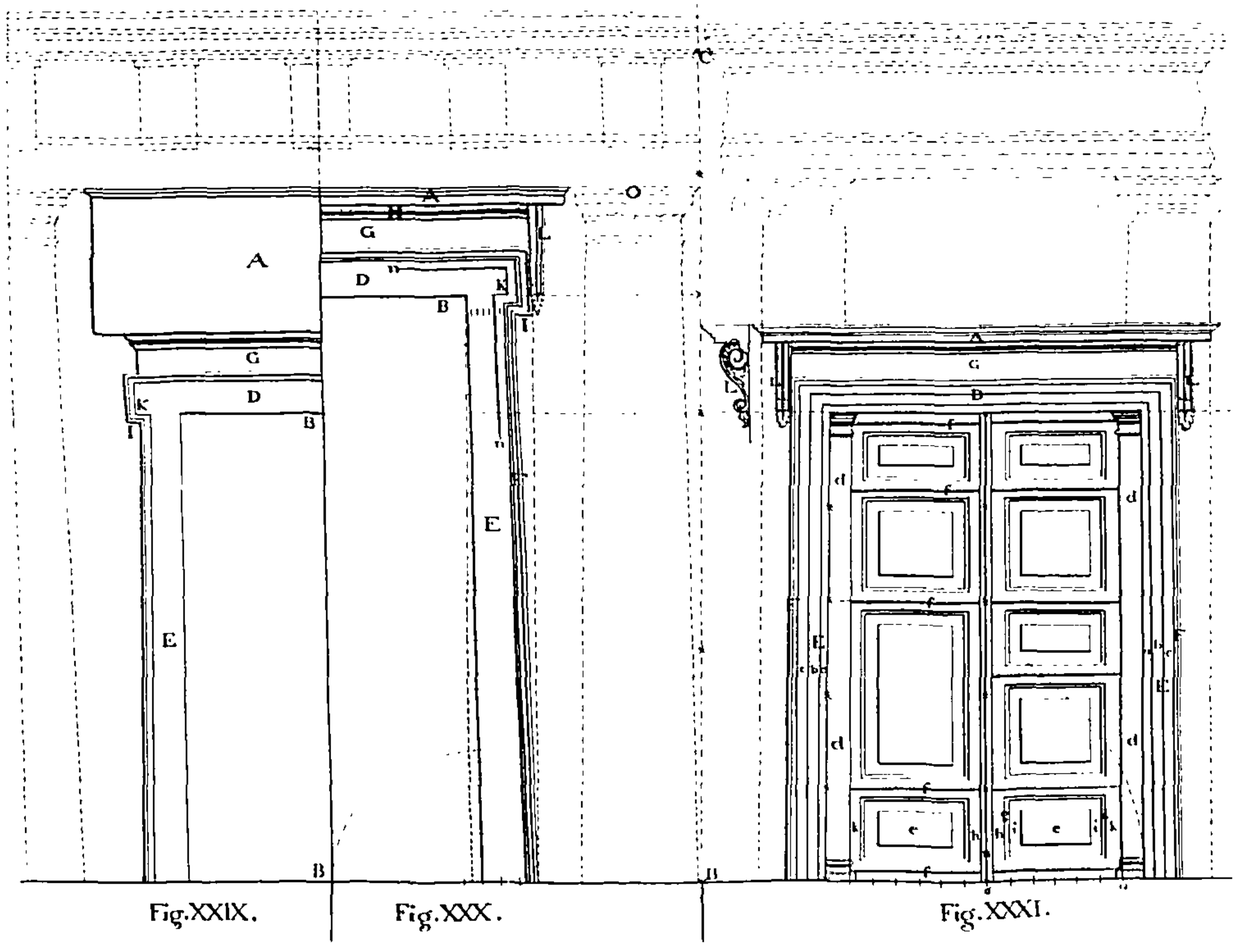


Fig.XXIX. Fig.XXX. Fig.XXXI.

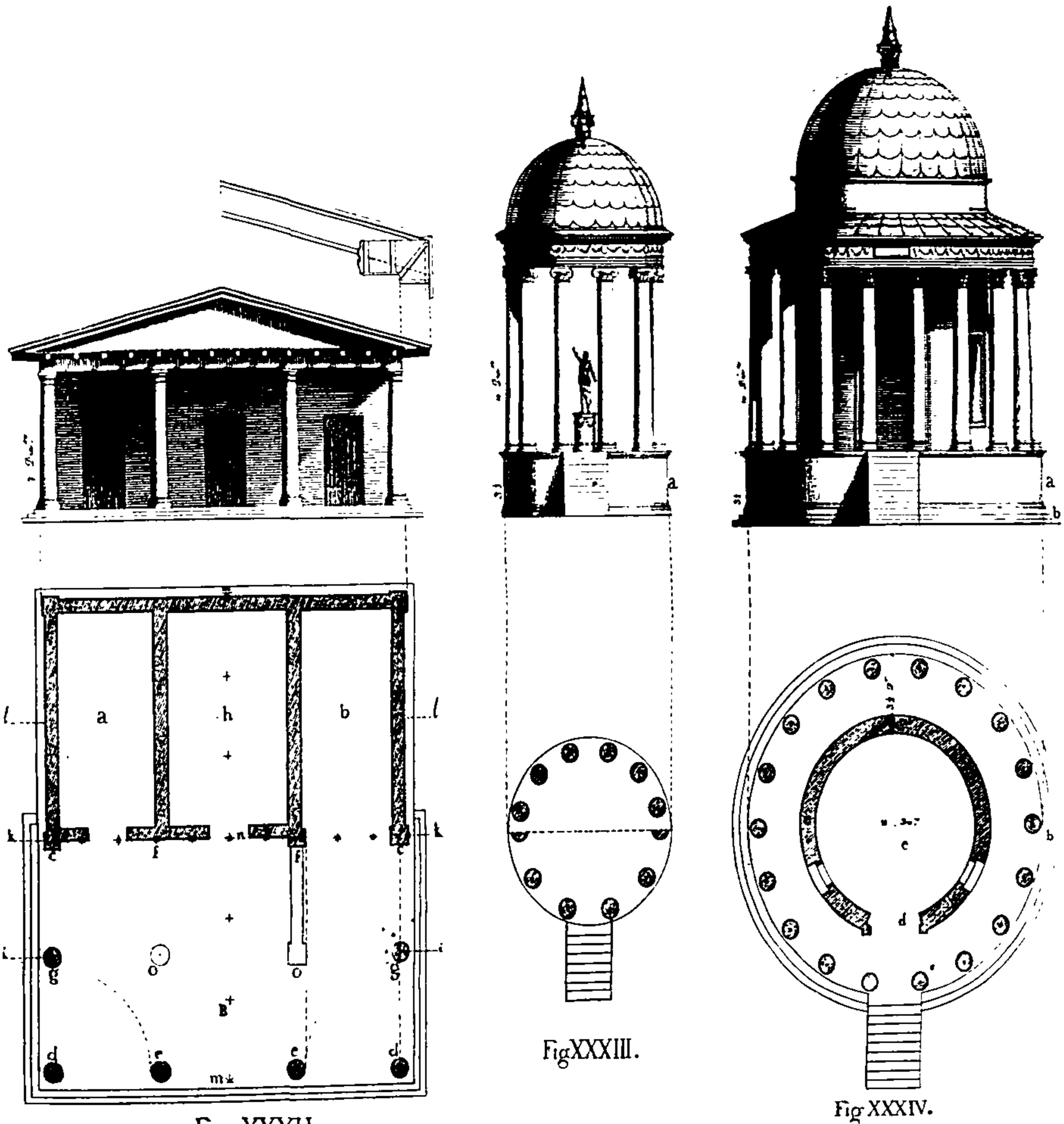


Fig. XXXII.

FigXXXIII.

Fig XXXIV.

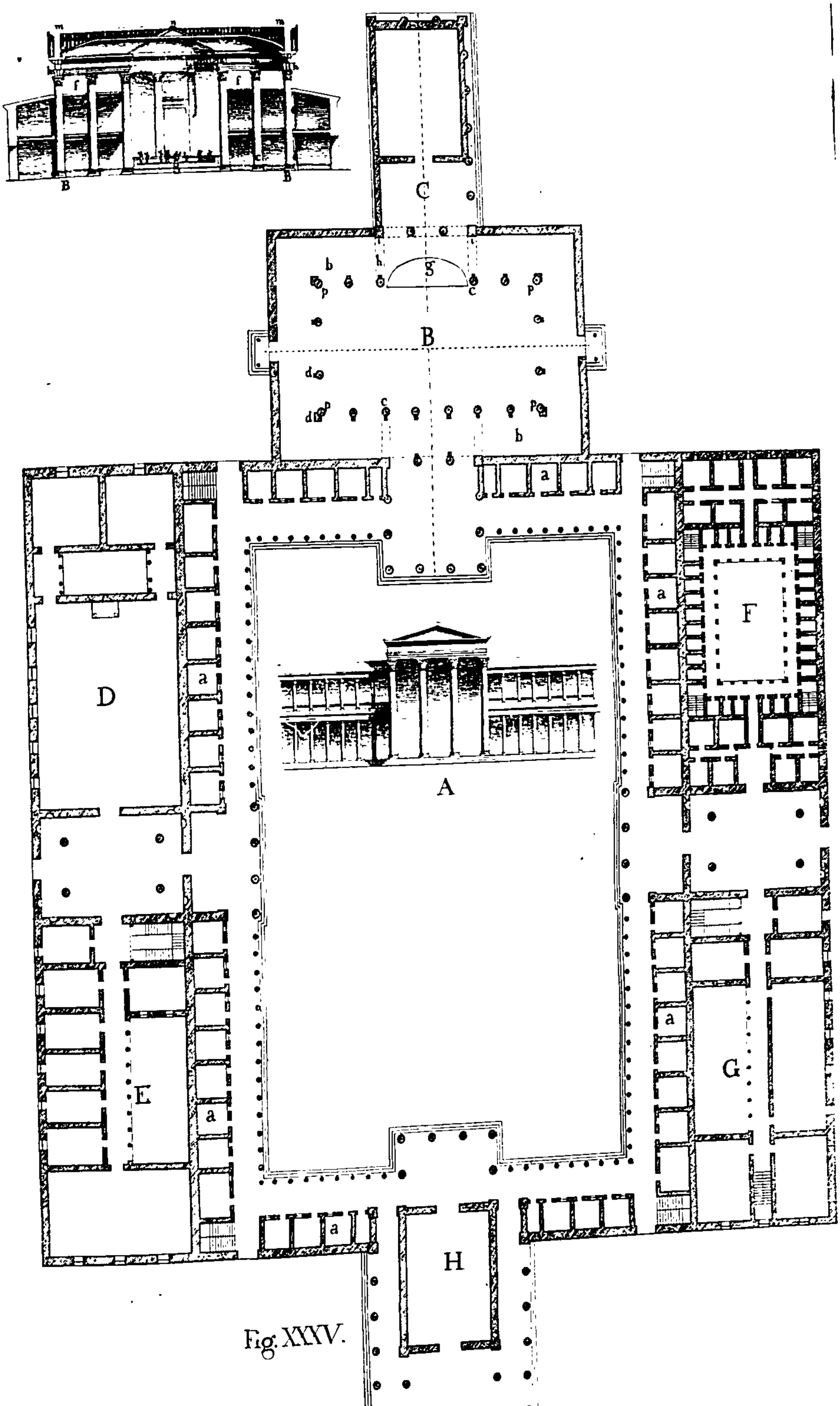
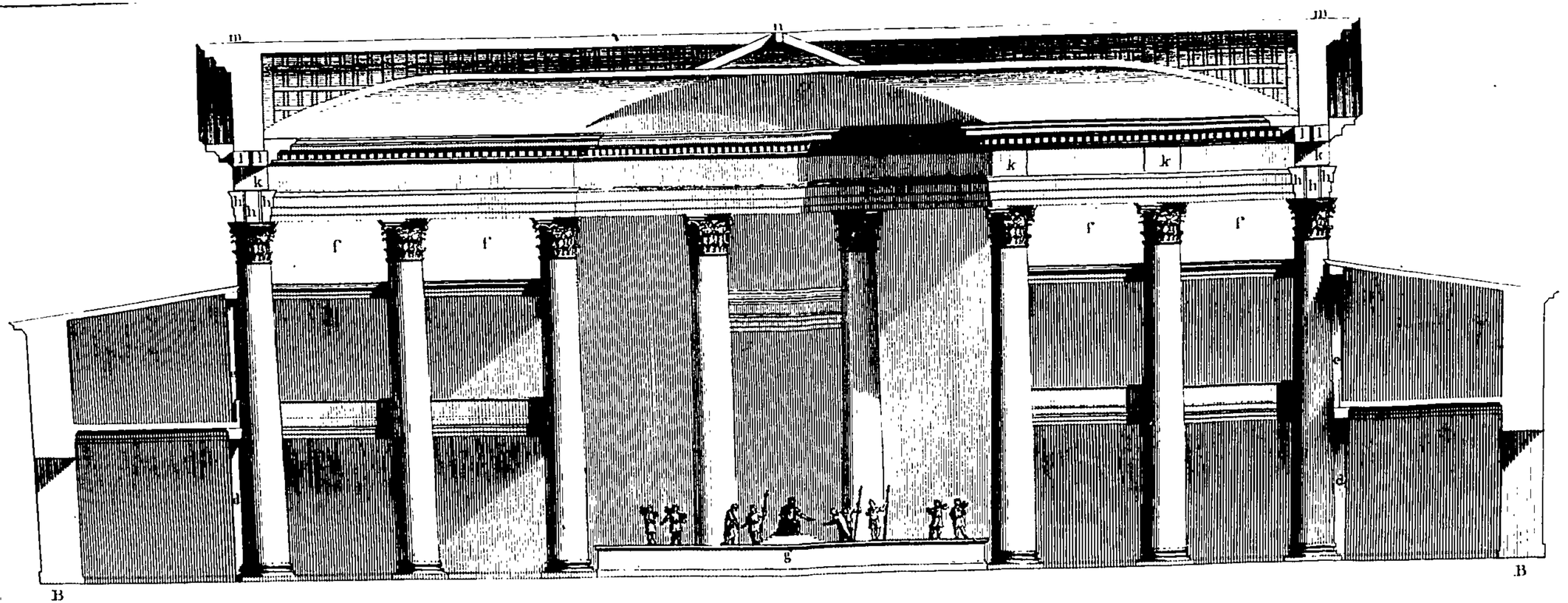


Fig. XXXV.



Section of the Basilica built by VITRUVIUS at Fano.

T. Newton Sculpt.

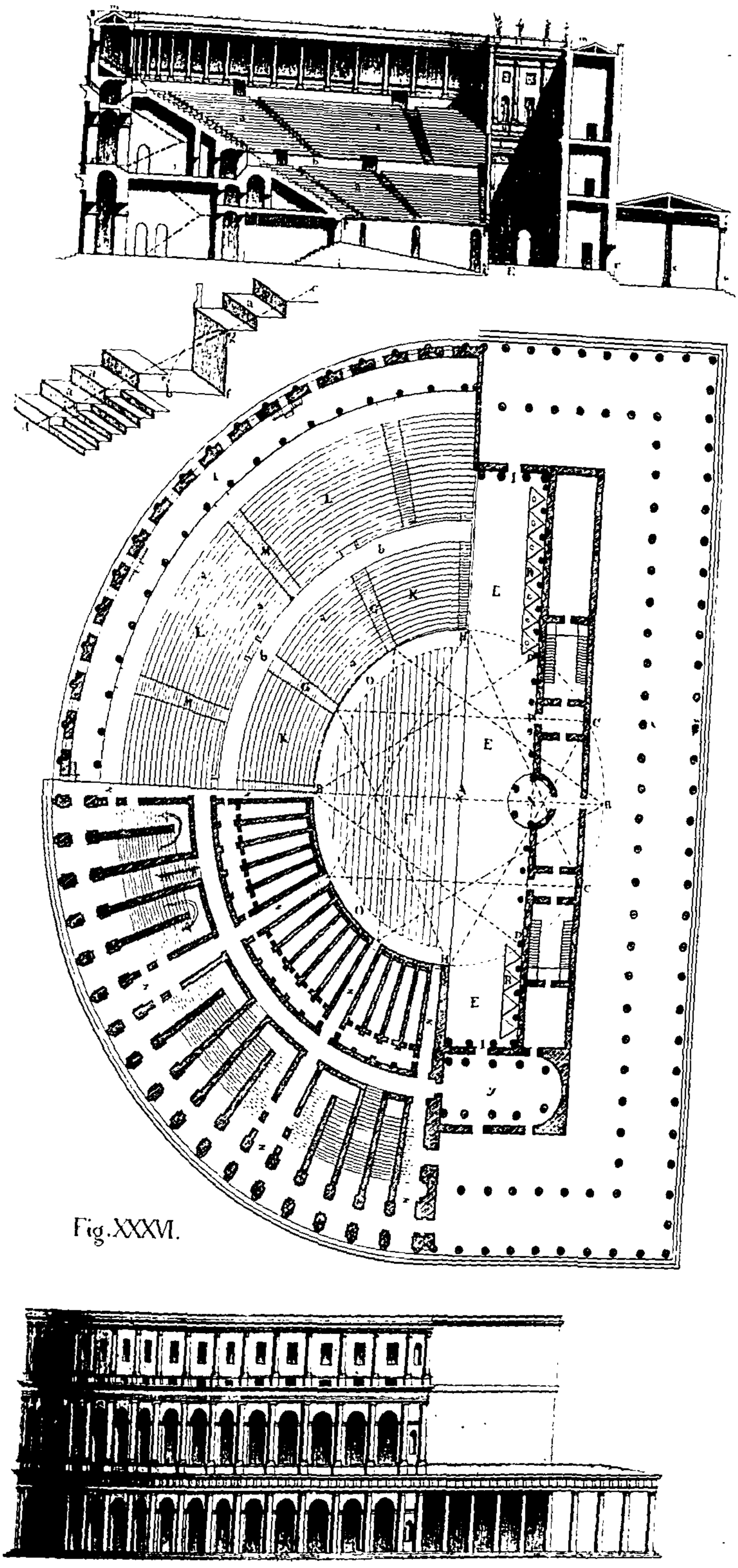


Fig. XXXVI.

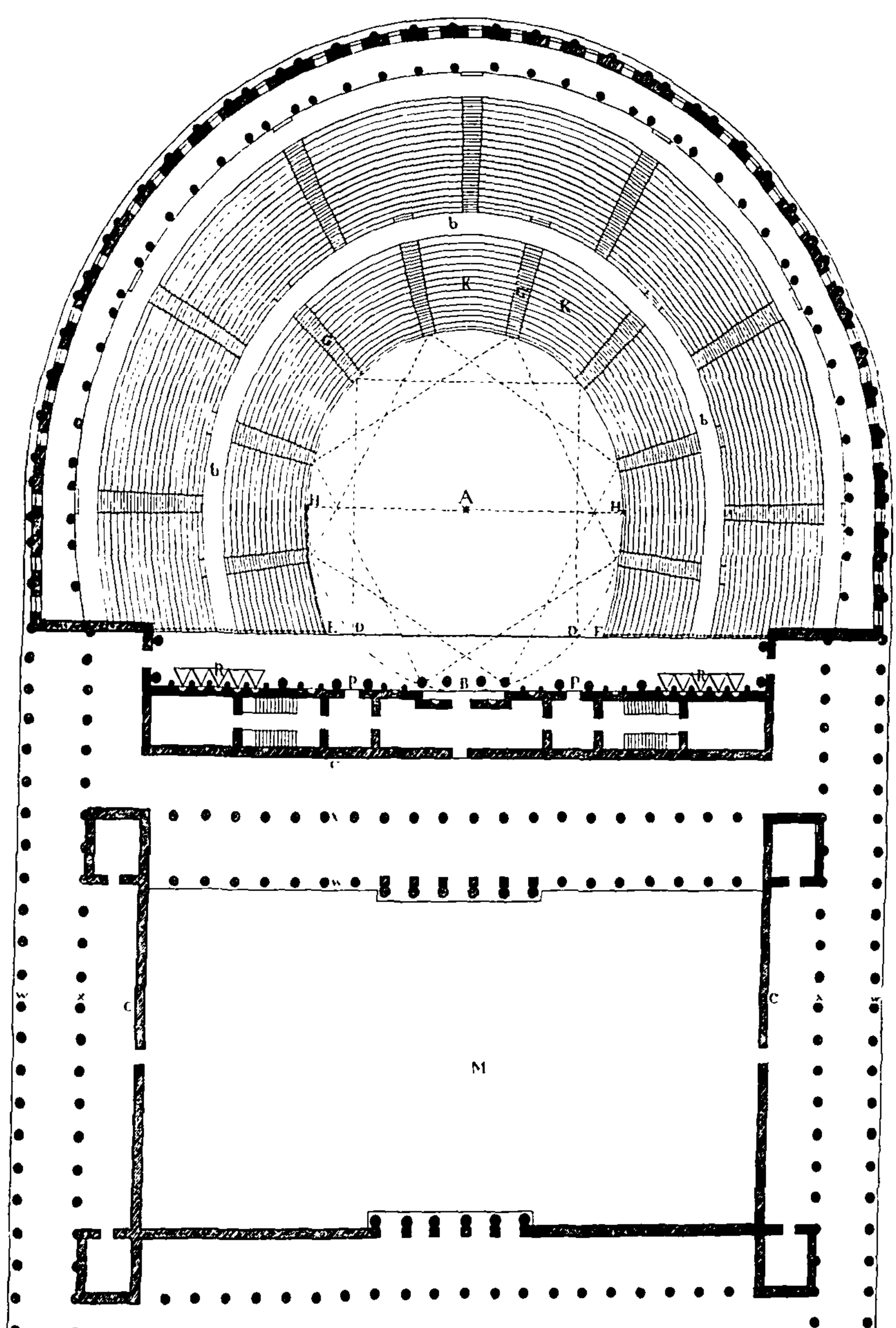
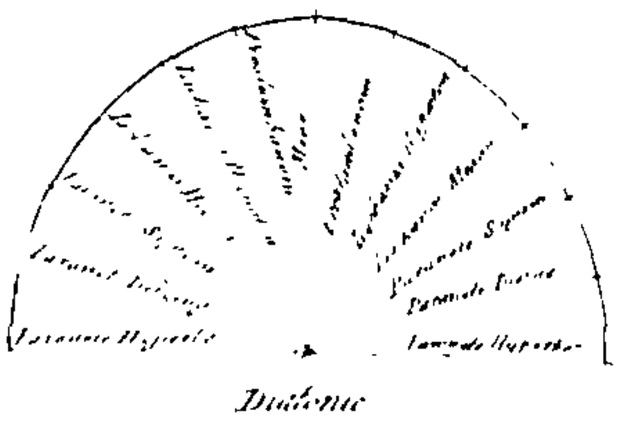
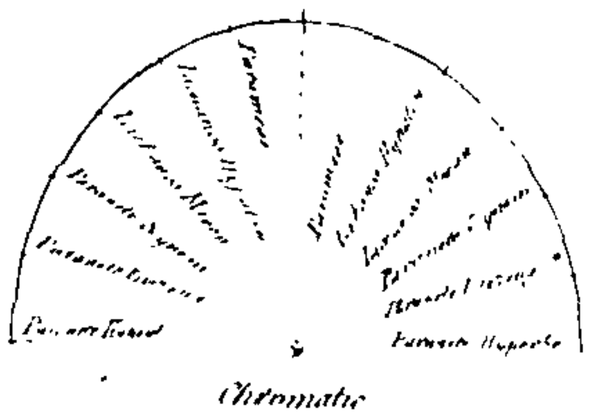


Fig.XXXVII.



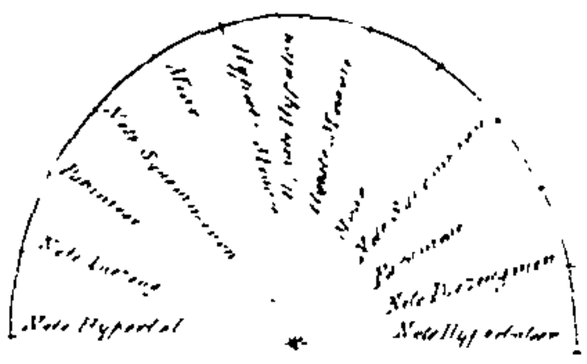
Diatonic

Fig XLI



Chromatic

Fig XL



Enharmonic

Fig XXXIX.

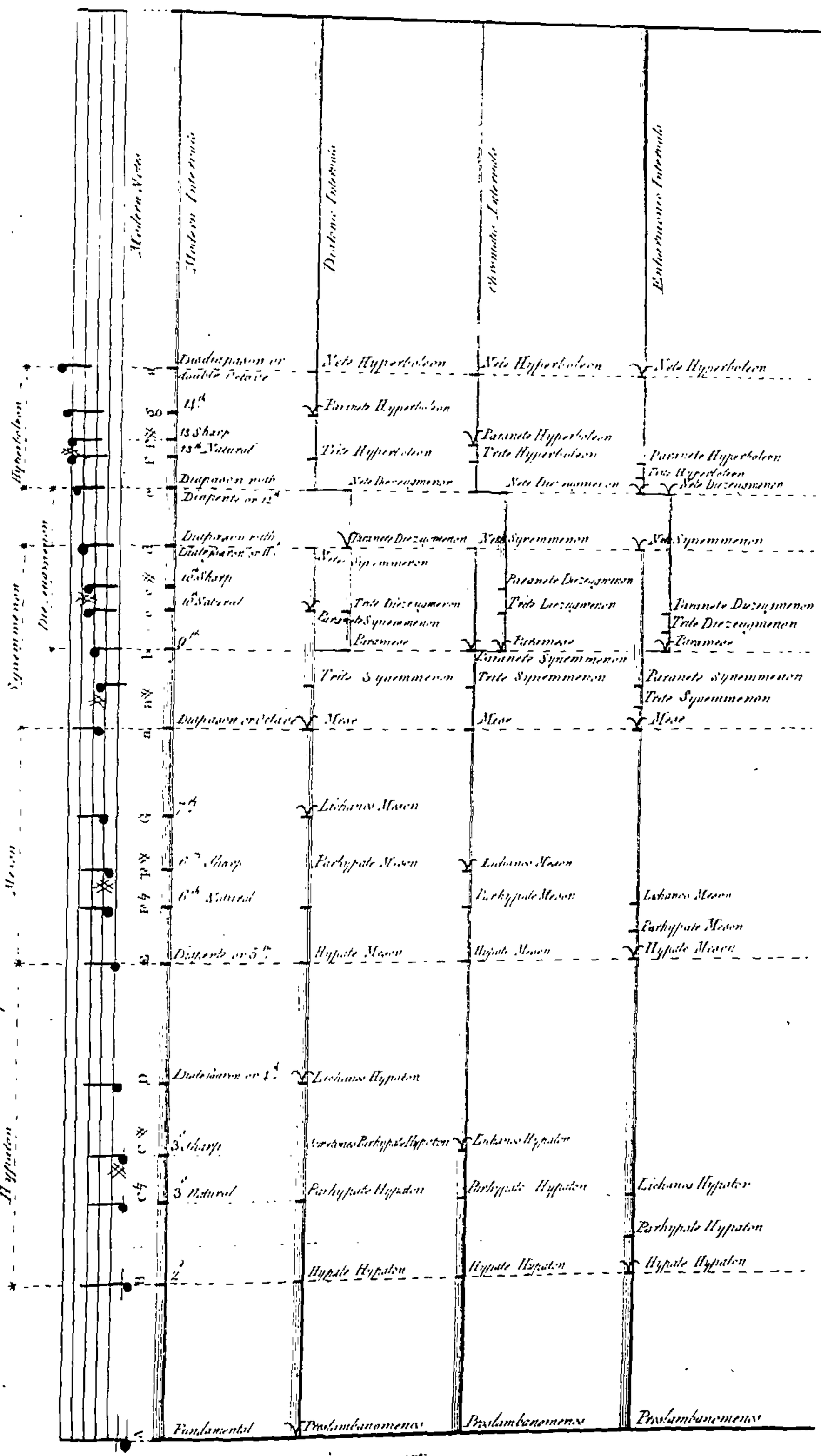


Fig. XXXVIII.

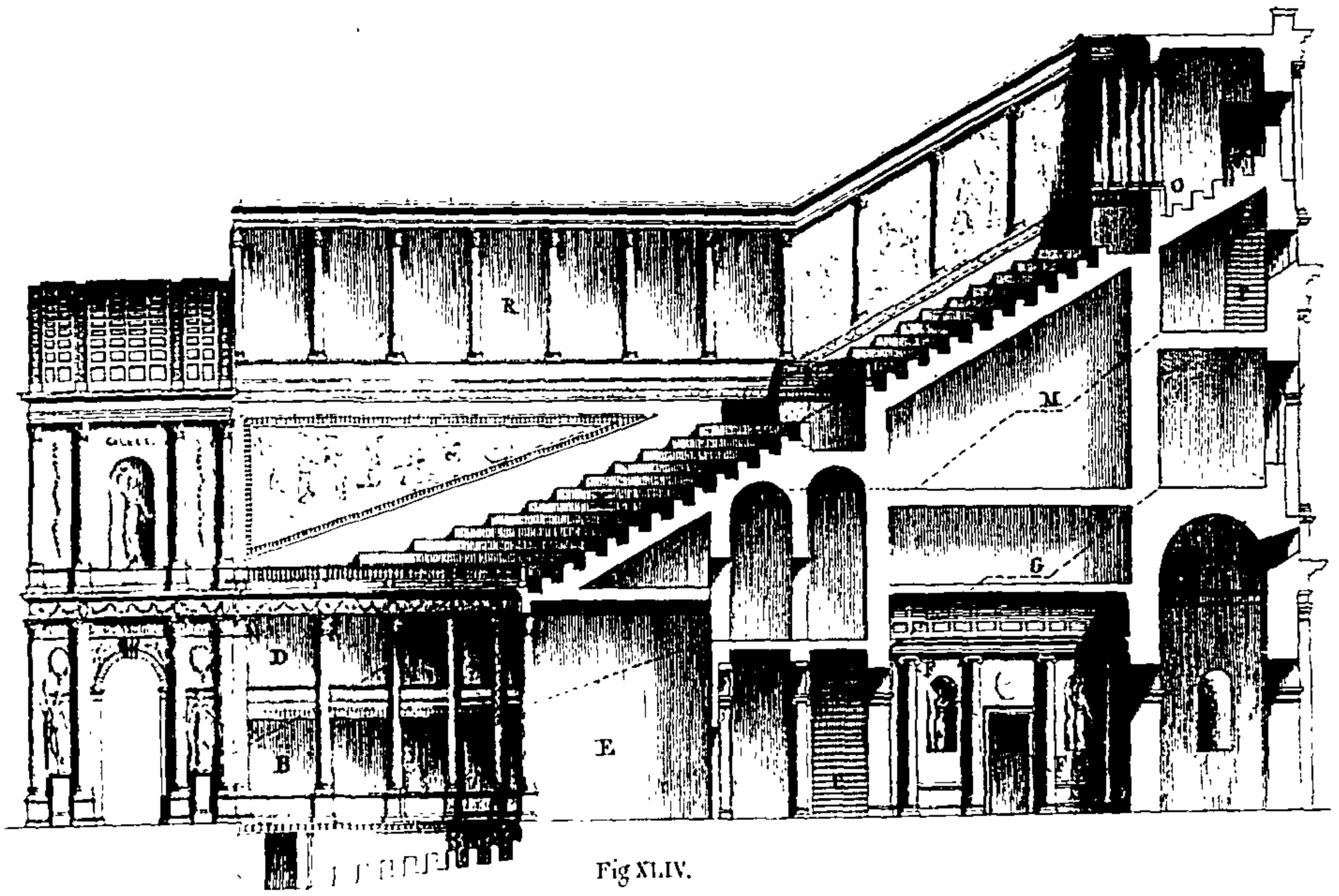


Fig XLIV.

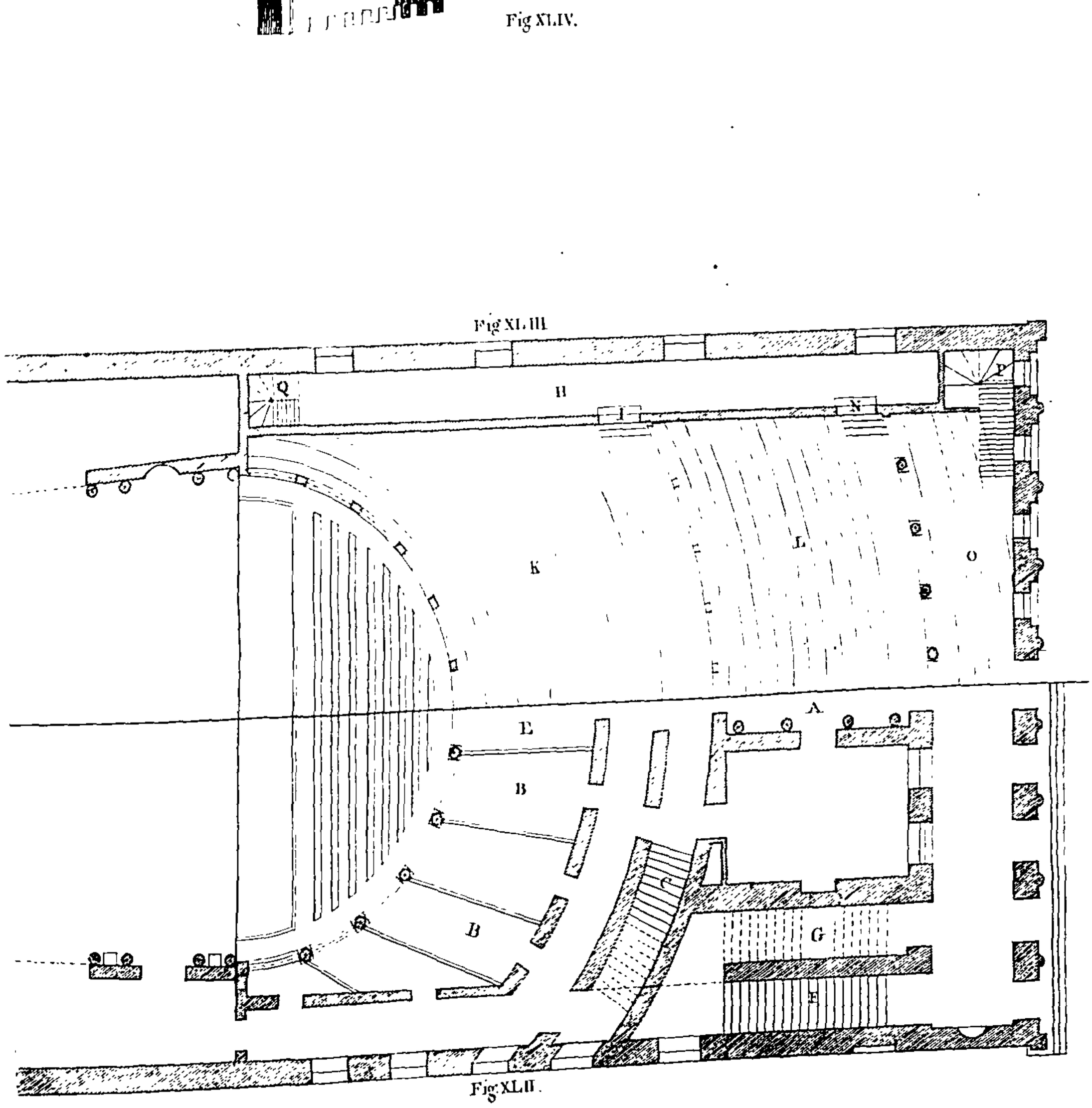


Fig XLIII.

Fig XLII.

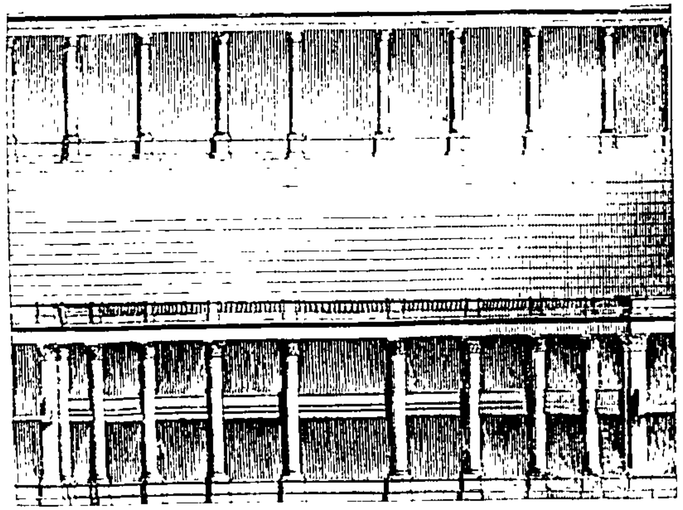


Fig XLVI.

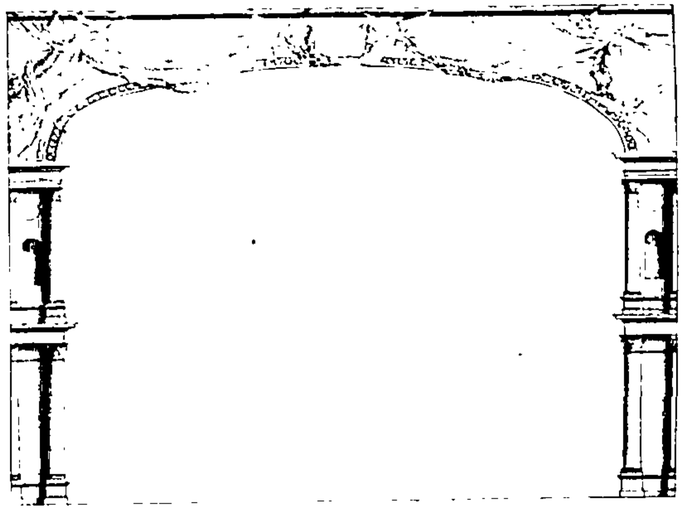


Fig XLVII.

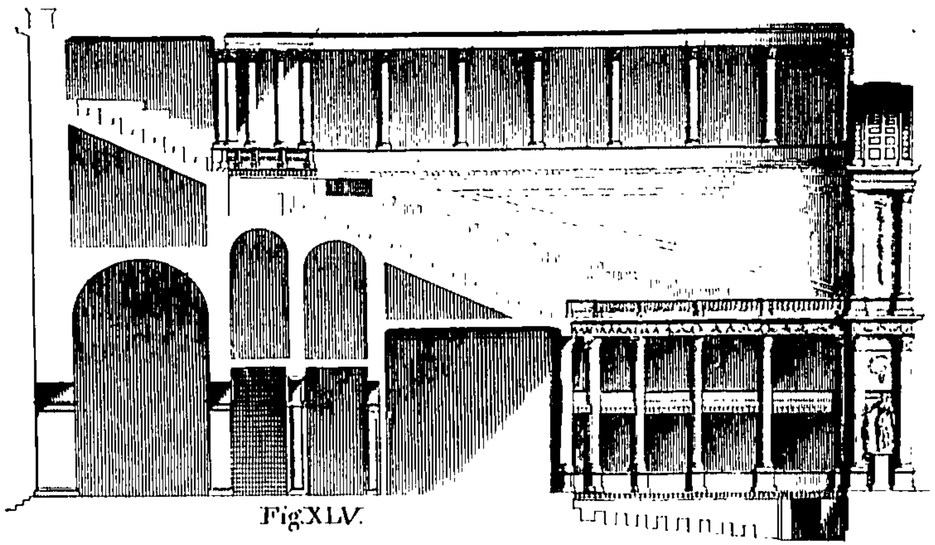


Fig XLV.

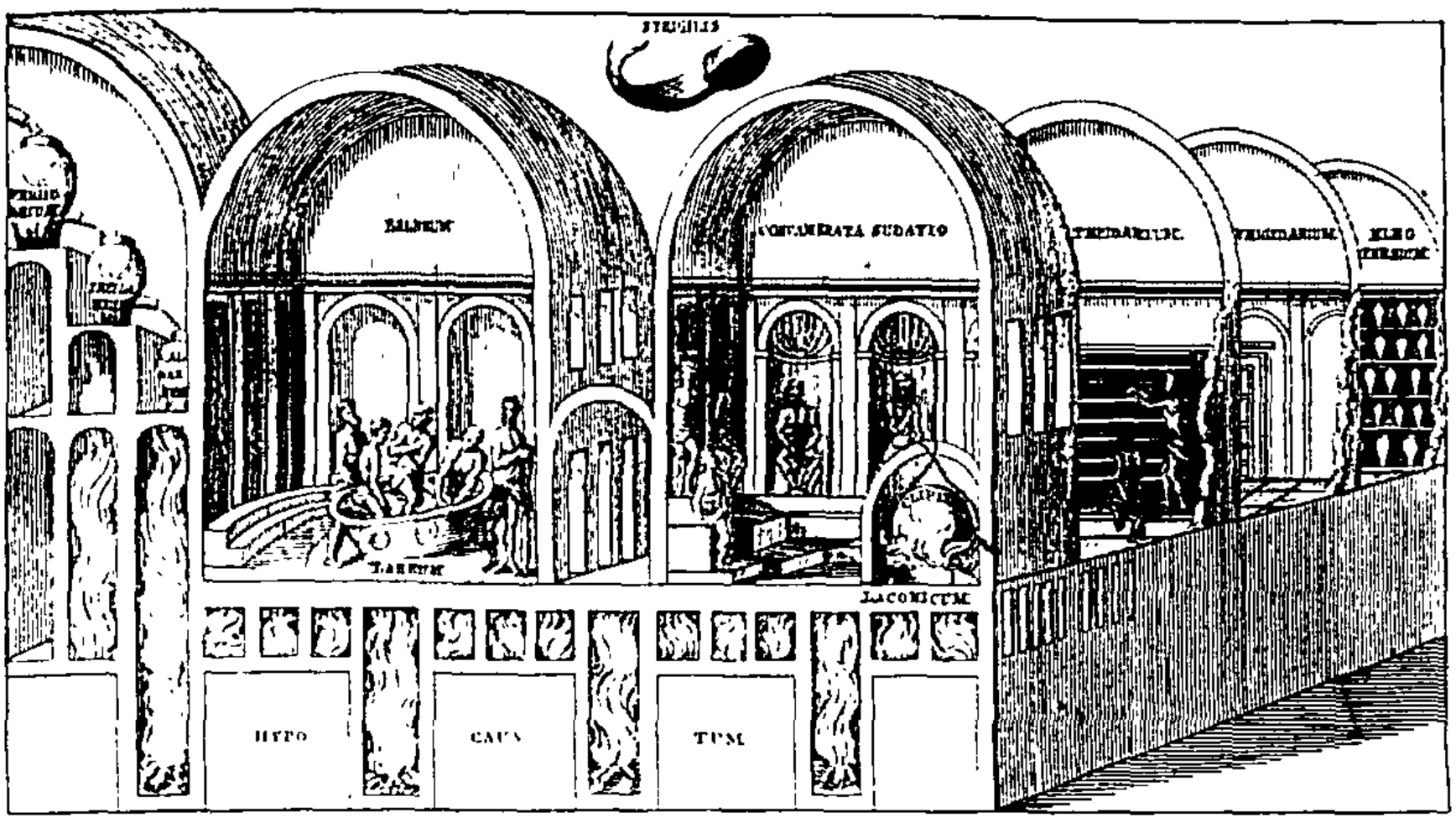


Fig XLIX.

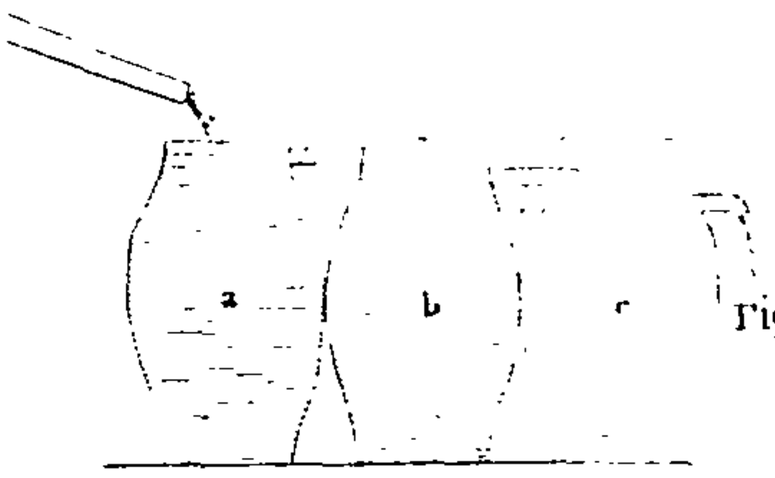


Fig L.

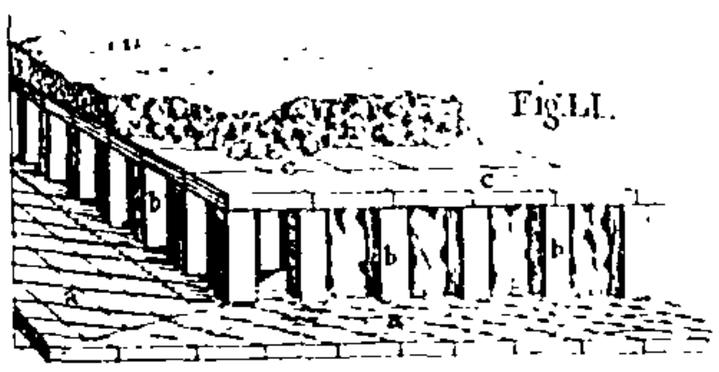


Fig LI.

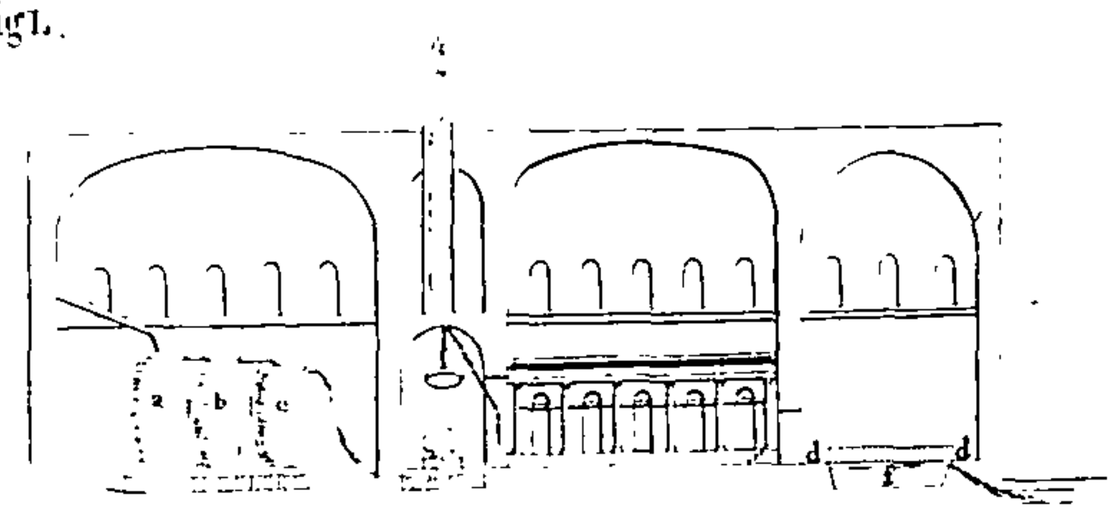
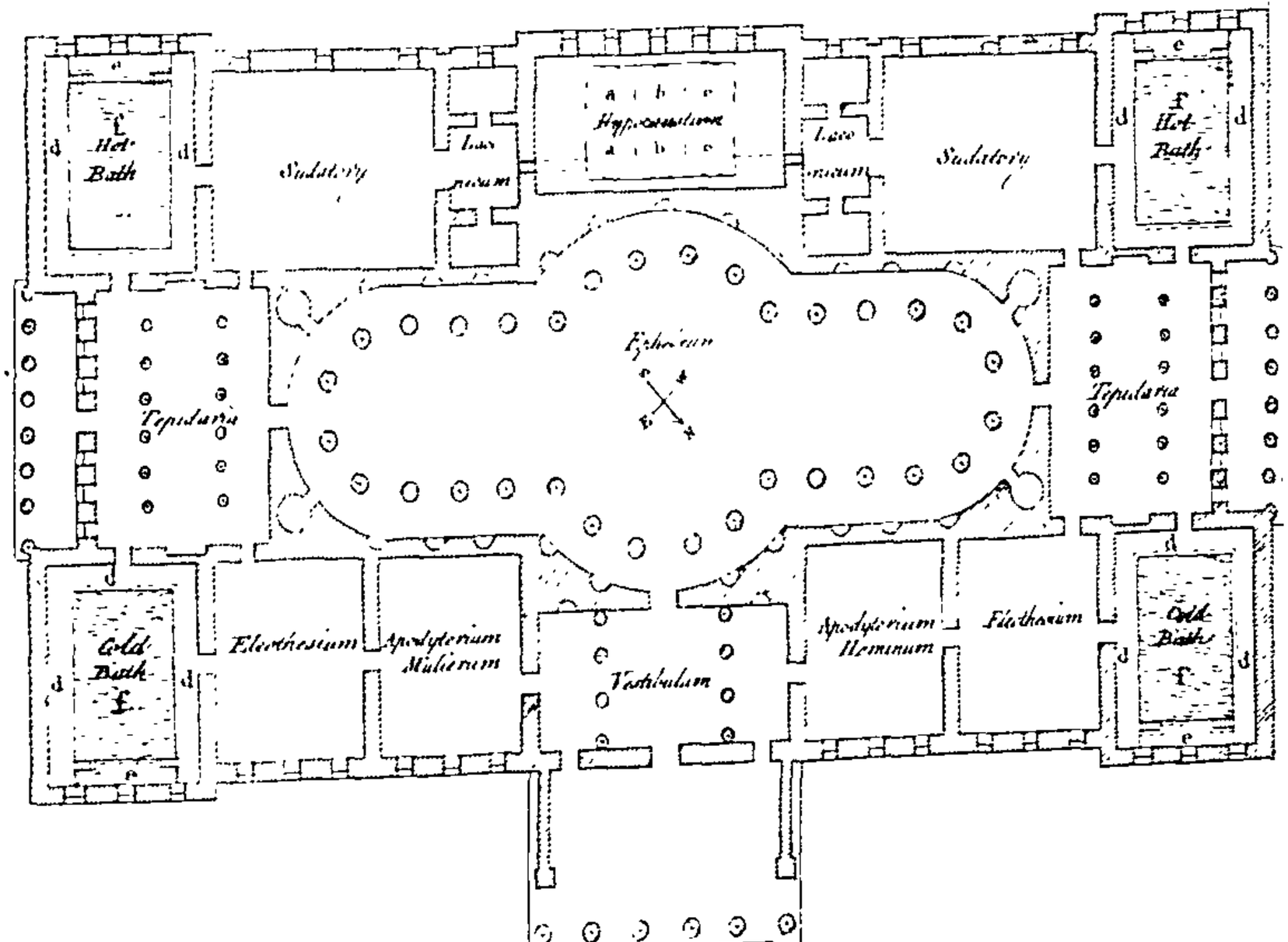


Fig XLVIII



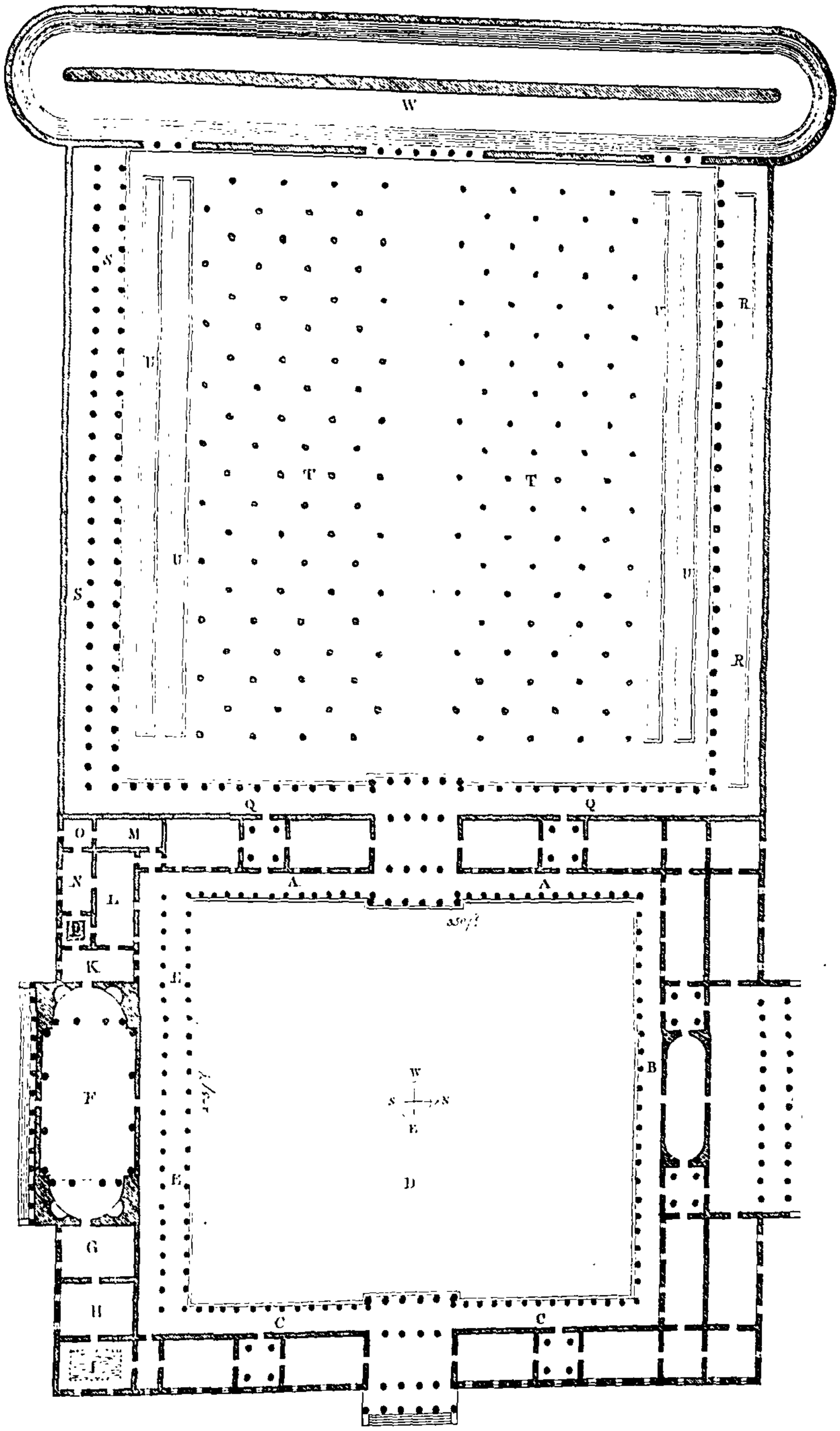


Fig.LII.